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VOL. XII.—EIGHTH SERIES.  
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"Omnes res creatæ sunt divinæ sapientiæ et potentiæ testes, divitiæ felicitatis humanæ:—ex harum usu *bonitas* Creatoris; ex pulchritudine *sapientia* Domini; ex œconomiâ in conservatione, proportionè, renovatione, *potentia* majestatis elucet. Earum itaque indagatio ab hominibus sibi relictis semper æstimata; à verè eruditis et sapientibus semper exulta; malè doctis et barbaris semper inimica fuit."—LINNÆUS.

"Quel que soit le principe de la vie animale, il ne faut qu'ouvrir les yeux pour voir qu'elle est le chef-d'œuvre de la Toute-puissance, et le but auquel se rapportent toutes ses opérations."—BRUCKNER, *Théorie du Système Animal*, Leyden, 1767.

. . . . . The sylvan powers  
Obey our summons; from their deepest dells  
The Dryads come, and throw their garlands wild  
And odorous branches at our feet; the Nymphs  
That press with nimble step the mountain-thyme  
And purple heath-flower come not empty-handed,  
But scatter round ten thousand forms minute  
Of velvet moss or lichen, torn from rock  
Or rifted oak or cavern deep: the Naiads too  
Quit their loved native stream, from whose smooth face  
They crop the lily, and each sedge and rush  
That drinks the rippling tide: the frozen poles,  
Where peril waits the bold adventurer's tread,  
The burning sands of Borneo and Cayenne,  
All, all to us unlock their secret stores  
And pay their cheerful tribute.

J. TAYLOR, *Norwich*, 1818.

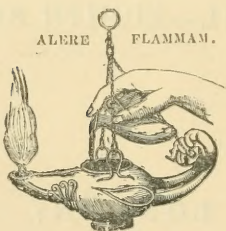
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# CONTENTS OF VOL. XII.

[EIGHTH SERIES.]

## NUMBER 67.

	Page
I. Description of new Species of <i>Pyralidæ</i> of the Subfamily <i>Pyraustinæ</i> . By Sir GEORGE F. HAMPSON, Bart., F.Z.S., &c. ....	1
II. Notes on the Lamellicorn Genus <i>Popillia</i> and Descriptions of some new Oriental Species in the British Museum. By GILBERT J. ARROW .....	38
III. Some Mycetophilid Synonymy (Diptera). By F. W. EDWARDS. ....	55
IV. Some new Species of Indian <i>Tenebrionidæ</i> . By K. G. BLAIR. ....	56
V. On a new Species of <i>Clementia</i> . By A. J. JUKES-BROWNE, F.R.S., F.G.S. (Plate I.).....	58
VI. Descriptions of new Species of African Heterocera in the Oxford Museum. By G. T. BETHUNE-BAKER, F.L.S., F.Z.S. ....	62
VII. Descriptions of Four new Fishes discovered by Mr. G. L. Bates in the Nyong River, S. Cameroon. By G. A. BOULENGER, F.R.S. ....	67
VIII. On the Presence of Two closely allied Species of Toads of the Genus <i>Nectophryne</i> in Cameroon. By G. A. BOULENGER, F.R.S. ....	70
IX. Description of a new Snake discovered by Mr. A. E. Pratt in Eastern Peru. By G. A. BOULENGER, F.R.S. ....	72
X. Note on an interesting Abnormality in <i>Echinus esculentus</i> . By HERBERT L. HAWKINS, M.Sc., F.G.S., Lecturer in Geology, University College, Reading .....	73
XI. Descriptions of new Species belonging to the Homopterous Family <i>Cicadidæ</i> . By W. L. DISTANT .....	76
XII. On new Species of <i>Histeridæ</i> and Notices of others. By G. LEWIS, F.L.S. (Plate II.) .....	81

	Page
XIII. Some new Fern from Asia and Africa. By OLDFIELD THOMAS .....	88
XIV. Notes on the <i>Apidae</i> (Hymenoptera) in the Collection of the British Museum, with Descriptions of new Species. By GEOFFREY MEADE-WALDO, M.A. ....	92
XV. Descriptions and Records of Bees.—LIII. By T. D. A. COCKERELL, University of Colorado .....	103
XVI. Description of a new Species of Agouti ( <i>Myoprocta</i> ). By R. I. POOCOKE, F.R.S. ....	110
XVII. The Classification of the Percoid Fishes. By C. TATE REGAN, M.A. ....	111
Proceedings of the Geological Society .....	146—152

## NUMBER 68.

XVIII. Notes from the Gatty Marine Laboratory, St. Andrews.—No. XXXV. By Prof. M'INTOSH, M.D., LL.D., F.R.S., &c. ....	153
XIX. Observations on Coleoptera of the Family <i>Buprestidae</i> , with Descriptions of new Species. By CHAS. O. WATERHOUSE, L.S.O., F.E.S. ....	181
XX. On new Species of Indian <i>Carcidinidae</i> . — Part II. By GUY A. K. MARSHALL .....	184
XXI. Observations on the Coloration of <i>Echinus angulosus</i> , A. Agass. By J. STUART THOMSON, Ph.D., F.L.S., F.R.S.E., Lecturer in Vertebrate Zoology, Victoria University of Manchester .....	190
XXII. New and little-known Diptera Nematocera from Ceylon. By F. W. EDWARDS .....	199
XXIII. On new Mammals obtained by the Utakwa Expedition to Dutch New Guinea. By OLDFIELD THOMAS .....	205
XXIV. Some new Species of <i>Uromys</i> . By OLDFIELD THOMAS. .	212
XXV. Further Notes on the Skull, Brain, and Organs of Special Sense of <i>Diademodon</i> . By D. M. S. WATSON, M.Sc., Lecturer in Vertebrate Palaeontology in University College, London .....	217
XXVI. Note on <i>Myrine capensis</i> . By C. TATE REGAN, M.A. .	229
XXVII. A new Species of the Crustacean Genus <i>Thaumastocheles</i> . By W. T. CALMAN, D.Sc. ....	23
XXVIII. Descriptions of new Species of Mollusca. By G. B. SOWERBY, F.L.S. (Plate III.) .....	233
Proceedings of the Geological Society .....	239—244



## NUMBER 69.

	Page
XXIX. A Report on the Extra-Antarctic Amphipoda Hyperiidea collected by the 'Discovery.' By DOROTHY A. STEWART, B.Sc., Platt Zoological Research Scholar, the University of Manchester. (Plates IV.-VII.)	245
XXX. Note on the Crop in the Mallophaga and on the Arrangement and Systematic Value of the Crop-Teeth. By BRUCE F. CUMMINGS	266
XXXI. A new Genus of Glossophagine Bat from Colombia. By OLDFIELD THOMAS	270
XXXII. <i>Ephemeridæ</i> from Tropical Africa. By the Rev. A. E. EATON, M.A., F.E.S.	271
XXXIII. Fishes from Peru, collected by Dr. H. O. Forbes. By C. TATE REGAN, M.A.	278
XXXIV. Fishes from the River Ucayali, Peru, collected by Mr. Mounsey. By C. TATE REGAN, M.A.	281
XXXV. Contributions to a Knowledge of Oriental Rhynchota. By W. L. DISTANT	283
XXXVI. On a Kangaroo and a new Palm-Civet in the British Museum. By ERNST SCHWARZ	288
XXXVII. Brief Descriptions of new Thysanoptera.—I. By RICHARD S. BAGNALL, F.L.S., F.E.S. (Hope Department of Zoology, University Museum, Oxford)	290
XXXVIII. Descriptions of new Species of <i>Pyralidæ</i> of the Subfamily <i>Pyraustineæ</i> . By Sir GEORGE F. HAMPSON, Bart., F.Z.S., &c.	299
Geological Society	319

## NUMBER 70.

XXXIX. Descriptions of new Species of <i>Staphylinidæ</i> from the West Indies. By MALCOLM CAMERON, M.B., R.N., F.E.S.—Part I.	321
XL. On new Species of <i>Histeridæ</i> and Notices of others, with Descriptions of new Species of <i>Niponius</i> . By G. LEWIS, F.L.S. (Plate VIII.)	351
XLI. The Geographical Races of the Woolly Opossum ( <i>Philander laniger</i> ). By OLDFIELD THOMAS	358
XLII. Three new Voles from the Inner Hebrides, Scotland. By G. E. H. BARRETT-HAMILTON and MARTIN A. C. HINTON	361

	Page
XLIII. Descriptions and Records of Bees.—LIV. By T. D. A. COCKERELL, University of Colorado .....	368
XLIV. <i>Thaumastotherium osborni</i> , a new Genus of Perissodactyles from the Upper Oligocene Deposits of the Bugti Hills of Baluchistan.—Preliminary Notice. By C. FORSTER-COOPER, M.A., University Demonstrator in Comparative Morphology, Cambridge .....	376
XLV. Notes on <i>Actinostola callosa</i> (Verrill) = <i>Dysactis crassicornis</i> (Hertwig). By OLWEN M. REES, B.Sc., U.C.W. Aberystwyth.	382
XLVI. A new Species of Dwarf Potto. By OLDFIELD THOMAS .	387
XLVII. British Fossil Crinoids.—IX. <i>Cydonocrinus parvulus</i> , n. g. et sp., Yoredale Beds, Yorkshire. By F. A. BATHER, F.R.S. .	388
XLVIII. Notes on the Lamellicorn Coleoptera of Japan and Descriptions of a few new Species. By G. J. ARROW, .....	394

## NUMBER 71.

XLIX. On a small Collection of Marine Shells from Henderson Island. By E. A. SMITH, I.S.O. (Plate IX.) .....	409
L. Some Notes on the Parasitic Copepod <i>Thersitina gasterostei</i> , Pagenstecher. By ROBERT GURNEY, M.A. (Plates X.—XIII.) ..	415
LI. Synopsis of the Melolonthid Genus <i>Ancistrosoma</i> , with Descriptions of new Species and an allied new Genus. By G. J. ARROW, .....	425
LII. New Minute Terrestrial and Aquatic Mollusca from the Dutch East Indian Island of Beilan-Beilan, with Descriptions of Four new Genera and Subgenera. By H. B. PRESTON, F.Z.S. ....	432
LIII. A new Variety of <i>Polydesmus coriaceus</i> , Porat, and Note on a Centipede Monstrosity. By C. M. SELBIE, B.Sc. ....	439
LIV. Some hitherto-undescribed <i>Ipidæ</i> and <i>Platypodidæ</i> from India and Burma. By Lt.-Col. WINN SAMPSON, F.E.S. ....	443
LV. Note on the Voles of the <i>orcadensis</i> Group. By MARTIN A. C. HINTON .....	452
LVI. The Fishes of the San Juan River, Colombia. By C. TATE REGAN, M.A. ....	462
LVII. On the Shells known as <i>Gemma</i> , <i>Parastarte</i> , and <i>Psephidia</i> . By A. J. JUKES-BROWNE, B.A., F.R.S. ....	473
LVIII. <i>Rhynchotragus damarensis variani</i> , subsp. n. By R. E. DRAKE-BROCKMAN, M.R.C.S., L.R.C.P., F.Z.S. ....	481

	Page
LIX. Descriptions of Five new Cichlid Fishes from Africa. By G. A. BOULENGER, F.R.S. ....	482
LX. Undescribed Species of <i>Cicadidæ</i> . By W. L. DISTANT ....	485
LXI. Four new Species of <i>Apidæ</i> (Hymenoptera), with Notes on other Species. By GEOFFREY MEADE-WALDO, M.A. ....	491
LXII. Diptera from the Falkland Islands, with Descriptions of a new Genus and Two new Species. By ERNEST E. AUSTEN ....	498
Correction of Generic Name, by C. Forster-Cooper, M.A., University Demonstrator in Comparative Morphology, Cambridge....	504

## NUMBER 72.

LXIII. Descriptions and Records of Bees.—LV. By T. D. A. COCKERELL, University of Colorado .....	505
LXIV. New <i>Anthracothers</i> and allied Forms from Baluchistan.—Preliminary Notice. By C. FORSTER-COOPER, M.A., University Demonstrator in Comparative Morphology, Cambridge .....	514
LXV. Characters of new Genera and Species of Terrestrial Mollusca from Norfolk Island. By H. B. PRESTON, F.Z.S. ....	522
LXVI. Five new Siphonaptera from Asiatic Russia, collected by W. Rückbeil. By the Hon. N. CHARLES ROTHSCHILD, M.A. (Plates XIV. & XV.) .....	538
LXVII. Notes on the South-American Freshwater Flying-fish, <i>Gastrolepecus</i> , and the common Flying-fish, <i>Evocetus</i> . By W. G. RIDWOOD. (Plate XVI.) .....	544
LXVIII. <i>Phallostethus dunckeri</i> , a remarkable new Cyprinodont Fish from Johore. By C. TATE REGAN, M.A. ....	548
LXIX. Description of a new Loricariid Fish of the Genus <i>Plecostomus</i> from Rio Janeiro. By C. TATE REGAN, M.A. ....	555
LXX. On some recently received Rhynchota. By W. L. DISTANT. ....	556
LXXI. Descriptions of new Lizards in the Collection of the British Museum. By G. A. BOULENGER, F.R.S. ....	563
LXXII. Description of a new Cyprinodont Fish from the Sobat River. By G. A. BOULENGER, F.R.S. ....	566
LXXIII. New Mammals from South America. By OLDFIELD THOMAS .....	567
LXXIV. Descriptions of some new Forms of Antelope, with Notes. By the Hon. WALTER ROTHSCHILD, F.R.S., Ph.D. ....	574

	Page
LXXV. A Synopsis of the Genus <i>Tinamus</i> . By LORD BR- BOURNE, F.Z.S., M.B.O.U., and CHARLES CHUBB, F.Z.S., M.B.O.U.	577
LXXVI. Descriptions of new Genera and Species of <i>Noctuidæ</i> . By Sir GEORGE F. HAMPSON, Bart., F.Z.S. ....	530
Proceedings of the Geological Society .....	601, 602
Index .....	603

#### PLATES IN VOL. XII.

PLATE I.	Clementia obliqua and C. vatheleti.
II.	New species of Pheidoliphila, Chlamydopsis, and Aristomorphus.
III.	New species of Mollusca.
IV. }	Vibilia serrata.
V. }	
VI.	Vibilia hodgsoni.
VII.	Hemiscelus diplochelatus.
VIII.	New species of Cylistix, Onthophilus, and Niponius.
IX.	New species of Engina, Tritonidea, and Calliostoma.
X. }	
XI. }	Thersitina gasterostei.
XII. }	
XIII.	
XIV. }	Siphonaptera from Asiatic Russia.
XV. }	
XVI.	Gastrolepecus stellatus.



THE ANNALS  
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[EIGHTH SERIES.]

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"..... per litora spargite muscum,  
Naiades, et circum vitreos considite fontes:  
Pollice virgineo teneros hic carpite flores:  
Floribus et pictum, divæ, replete canistrum.  
At vos, o Nymphæ Craterides, ite sub undas;  
Ite, recurvato variata corallia trunco  
Vellite muscosis e rupibus, et mihi conchas  
Ferte, Deæ pelagi, et pingui conchyliis succo."  
N. Parthenii Giannettusi, Ecl. 1.

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No. 67. JULY 1913.

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I. — *Descriptions of new Species of Pyralidæ of the Sub-family Pyraustinae.* By Sir GEORGE F. HAMPSON, Bart., F.Z.S., &c.

[Continued from vol. xi. p. 530.]

(4) *Exeristis argyresthalis*, sp. n.

♂. Head, thorax, and abdomen brownish white. Fore wing brownish white, the costal edge golden brown to beyond middle; a slight subbasal silvery line; an indistinct yellowish antemedial band, edged by wavy silvery lines; a round yellowish spot in middle of cell defined by silver, and a similar discoidal spot constricted at middle; a postmedial yellowish and silvery band defined on each side by fine brown lines, slightly incurved below costa and oblique below vein 4, with some small brown and silvery somewhat dentate marks beyond it towards apex; a fine dark terminal line with two points at middle; cilia whitish, with a fine brown line through them. Hind wing ochreous white tinged with brown towards termen; cilia white.

*Hab.* N. AUSTRALIA, Port Darwin (*Buckland*), 1 ♂ type.  
*Exp.* 16 mm.

*Ann. & Mag. N. Hist.* Ser. 8. Vol. xii.

(5) *Criophthona aridalis*, sp. n.

♀. Head and thorax ochreous tinged with brown; palpi rufous, white below; abdomen ochreous white. Fore wing ochreous white irrorated with dark brown and tinged with rufous towards costa, the costal edge white; a faint dark discoidal spot; postmedial line dark, rather diffused, excurved from costa to vein 3, then retracted to below angle of cell; cilia white, with dark lines near base and at tips. Hind wing white; the underside with the costal area irrorated with brown, a slight dark spot at upper angle of cell and punctiform postmedial line from costa to vein 3.

*Hab.* CAPE COLONY, Zuurberg (*Bairstow*), 1 ♀ type. *Exp.* 20 mm.

(7 a) *Metasia arida*, sp. n.

Frons slightly produced.

Head, thorax, and abdomen grey-white tinged with brown. Fore wing grey-white tinged with brown; an indistinct curved antemedial brown line; postmedial line brown, slightly sinuous towards costa, excurved from discal fold to below vein 3, then bent inwards to below angle of cell, and slightly sinuous to inner margin; a terminal series of dark points. Hind wing grey-white tinged with brown; postmedial line slight, brown, excurved from discal fold to below vein 3, then obsolete; a terminal series of dark points.

*Hab.* SIERRA LEONE (*Clements*), 1 ♀; N. NIGERIA, Borgu, Yelwa Lake (*Migeod*), 1 ♀ type. *Exp.* 14 mm.

(7 b) *Metasia eremialis*, sp. n.

Frons produced to a long process rounded at extremity.

♂. Head, thorax, and abdomen white mixed with some brown; palpi and frontal process at sides dark brown. Fore wing white sparsely irrorated with brown, the costal area tinged with red-brown; an indistinct obliquely curved antemedial brown line; a brown annulus in middle of cell and elliptical discoidal annulus; postmedial line brown, straight from costa to vein 2, then retracted to below angle of cell and again excurved; a fine brown terminal line and a line through the cilia. Hind wing white slightly irrorated with brown; postmedial line slight, brown, oblique and slightly sinuous to vein 2, then retracted to below angle of cell and excurved to inner margin; a fine brown terminal line and a line near tips of cilia.

*Hab.* TRANSVAAL, Johannesburg (Cooke), 1 ♂ type. *Exp.* 22 mm.

(7 c) *Metasia perirrorata*, sp. n.

Frons produced to a moderate rounded process.

♂. Head, thorax, and abdomen greyish suffused with brown; sides of palpi and frons blackish; fore tibiæ at extremity and tarsi banded with blackish. Fore wing grey thickly irrorated with brown; a dark spot at base of costa; a dark antemedial line from cell to inner margin; two blackish discoidal striæ, and a patch of dark suffusion beyond lower angle of cell; postmedial line diffused, dark brown, excurved to near termen between veins 5 and 2 with some dark suffusion on its outer side below costa; cilia with a series of small dark spots. Hind wing grey, thickly irrorated and suffused with brown.

*Hab.* N. NIGERIA, Yorubaland, Ogbomoso (Carter), 1 ♂ type. *Exp.* 14 mm.

(10 c) *Metasia tumidalis*, sp. n.

Abdomen of male dilated at extremity with large protrusible genital tufts.

Ochreous tinged with pale red-brown; head and front of thorax suffused with fuscous; fore tibiæ banded with black; abdomen with dorsal black spots on last two segments. Fore wing with the costal area suffused with fuscous to beyond middle; an antemedial black line very oblique from costa to below median nervure and angled inwards on vein 1; a small annulus in middle of cell and discoidal lunulate annulus; the postmedial line angled outwards below costa, inwards in discal fold, at vein 2 retracted to below end of cell, then somewhat excurved again; the terminal area suffused with fuscous; cilia ochreous with a black line through them and their tips fuscous. Hind wing with minutely waved black line from discocellulars to inner margin above tornus; the postmedial line angled outwards at vein 5 and ending on termen at vein 2; the apical area suffused with fuscous down to vein 2; a waved black terminal line and a line through the cilia.

*Hab.* N. GUINEA, Milne B., 2 ♂ type, Mailu; FERGUSSON I., 1 ♂; RON I.; GOODENOUGH I.; WOODLARK; QUEENSLAND, Cedar B. (Meek), 1 ♀. *Exp.* 22 mm.

(12 a) *Metasia sinuifera*, sp. n.

Frons produced to a moderate rounded process.

♂. Head and thorax grey-white irrorated with fuscous;

palpi and frons black ; antennæ ringed with blackish ; fore and mid legs blackish above, the tarsi ringed with blackish ; abdomen grey-white tinged with brown. Fore wing grey-white thickly irrorated with fuscous ; some blackish at base of costa ; antemedial line blackish, angled outwards below costa, then oblique ; a small oblique elliptical blackish discoidal annulus ; postmedial line black, incurved at discal fold, obliquely excurved to vein 2, then retracted to below angle of cell, and erect to inner margin ; a fine black terminal line and lines near base and tips of cilia. Hind wing grey-white thickly irrorated with fuscous ; a rather diffused oblique black antemedial line ; postmedial line black, obliquely excurved from discal fold to vein 2 where it is retracted, then obsolete ; a fine black terminal line and lines near base and tips of cilia.

*Hab.* TRANSVAAL, White R. (Cooke), 2 ♂ type. *Exp.* 20 mm.

(16 a) *Metasia punctimarginalis*, sp. n.

♂. Head, thorax, and abdomen whitish irrorated with brown ; palpi blackish, white below ; fore tibiae and tarsi tinged with fuscous. Fore wing whitish tinged with brown and irrorated with fuscous, the basal half of costa fuscous, the terminal half with black striae ; an indistinct slightly waved antemedial line ; a fuscous spot in middle of cell and another rather further from base in submedian fold ; an oblique white discoidal lunule defined at sides by black ; postmedial line excurved below costa, slightly incurved at discal fold, excurved to vein 2, then retracted to below angle of cell and again slightly excurved ; a brown terminal line with series of black points on it ; cilia brownish white with fuscous line near base. Hind wing whitish tinged with brown and irrorated with fuscous ; a black discoidal spot ; postmedial line excurved between veins 5 and 2, then retracted to below angle of cell ; a brownish terminal line with series of black points on it ; cilia brownish white with fuscous line near base.

*Hab.* BORNEO, Sarawak (Wallace), 1 ♂ type. *Exp.* 14 mm.

(24 b) *Metasia bilunalis*, sp. n.

♂. Head, tegulae, and patagia ochreous ; palpi at sides and vertex of thorax dark brown ; pectus, legs, and abdomen ochreous. Fore wing ochreous slightly tinged with reddish



brown in parts ; an oblique blackish subbasal bar from submedian fold to inner margin ; a brown lunule defined by black in cell towards extremity confluent with a fascia below the cell angled inwards to near the subbasal bar ; an ochreous discoidal lunule defined by black except above, with two short obliquely placed black streaks below it ; a diffused brownish subterminal band, oblique towards costa, then with slight dentate black marks on it to above inner margin ; a terminal series of small dentate black marks ; cilia with a fine dark line near base. Hind wing uniform ochreous white ; cilia whitish with a slight brown line near base.

Palpi projecting about three times length of head ; fore wing very long and narrow.

*Hab.* VICTORIA, 1 ♂ type. *Exp.* 22 mm.

#### Genus GONOPIONEÆ, nov.

Type, *G. albilunalis*.

Palpi porrect, projecting about the length of head, triangularly scaled, the third joint hidden in hair ; maxillary palpi dilated with scales ; frons rounded ; antennæ laminate in both sexes, strongly so in male ; hind tibiæ with the outer medial spur about half length of inner. Fore wing with the termen strongly excurved at middle, excised below apex and towards tornus ; vein 3 from before angle of cell ; 4, 5 stalked ; 6 from below upper angle ; 7 from angle, straight and well separated from 8, 9 ; 10, 11 stalked. Hind wing with vein 3 from near angle of cell ; 4, 5 stalked ; 6, 7 from upper angle, 7 strongly anastomosing with 8.

#### (1) *Gonopionea sanguiflualis*, sp. n.

♂. Head white ; palpi except below and antennæ chestnut ; thorax pale crimson ; abdomen chestnut ; pectus, legs, and ventral surface of abdomen white. Fore wing pale crimson ; the costa brown to beyond middle ; a slightly sinuous deep crimson antemedial line ; a quadrate hyaline spot in end of cell, with some dark suffusion between it and the rounded hyaline spot beyond the cell which is bounded by the dark postmedial line, obliquely sinuous from it to inner margin ; a terminal brown line ; the cilia yellow, brown at middle. Hind wing yellowish white ; the termen brown from apex to vein 2, towards which it expands into a patch.

*Hab.* JAMAICA, Moneague (*Walsingham*), 1 ♂ type, Newcastle. *Exp.* 12 mm.

(2) *Gonopionea purpurealis*, sp. n.

♂. Head and thorax purplish pink; palpi whitish at base; antennæ with the shaft whitish above; pectus and legs white, the fore tibiæ and tarsi tinged with pink on inner side; abdomen purplish pink, the ventral surface white. Fore wing purplish pink; an oblique triangular yellow patch from middle of costa to just beyond the cell with whitish lunule on its lower part, the costa beyond it brown, yellow before apex; cilia yellow, dark brown at apex and middle. Hind wing white; the termen suffused with purplish pink, running inwards at vein 2 half way to cell; cilia white.

*Hab.* W. COLOMBIA, S. Antonio (*Palmer*), 1 ♂ type. *Exp.* 22 mm.

(3) *Gonopionea albilunalis*, sp. n.

Head, thorax, and abdomen pale reddish brown; frons whitish; pectus, legs, and ventral surface of abdomen white; fore tarsi with the terminal joint black. Fore wing pale reddish brown with a purple gloss; a waved black antemedial line from cell to inner margin; a white discoidal lunule, defined by black except above where it is conjoined to a whitish patch on costa, an oblique waved black line from its lower extremity to inner margin strongly angled inwards on vein 2; cilia white except at middle. Hind wing whitish, the terminal area broadly suffused with brown from costa to vein 2 with fuscous postmedial bar on its inner edge between veins 6 and 5; underside white with fuscous discoidal point and postmedial bar.

*Hab.* FR. GUIANA, St. Jean Maroni (*Schaus*), 1 ♀ type, type ♂ in Coll. Schaus. *Exp.*, ♂ 22, ♀ 26 mm.

(1 a) *Pionea pectinalis*, sp. n.

Antennæ of male bipectinate with rather long branches; mid tibiæ not dilated; hind tibiæ with the inner medial spur minute.

♂. Head and thorax cupreous yellow suffused with brown; pectus with three pairs of lateral brown spots; abdomen yellowish white with dorsal series of brown patches and lateral and ventral spots on basal segments. Fore wing cupreous yellow irrorated with brown, the base of costal area suffused with brown; an oblique diffused waved sub-basal line from costa to vein 1; a diffused waved antemedial line from subcostal nervure to inner margin; a round white

spot defined by black in upper angle of cell ; an oblique postmedial bar from below costa to vein 5, with a rather triangular whitish spot beyond it followed by a diffused lunulate black-brown patch with spot on costa above it and very oblique dentate line from it to inner margin ; some black points on costa towards apex and a terminal series. Hind wing white slightly tinged with yellowish towards termen on which there is a series of black points from apex to vein 2 where there is a larger spot ; the underside with black spots in and beyond upper angle of cell and a post-medial series slightly excurved below costa and strongly below vein 5.

*Hab.* COLOMBIA, Sierra del Libane, 6000' (*H. H. Smith*), 1 ♂ type. *Exp.* 28 mm.

(1 b) *Pionea albiflua*, sp. n.

♂. Head and tegulæ purplish red ; frons black-brown ; a whitish streak on vertex of head ; thorax brownish white with black fasciæ on shoulders and outer edge of patagia ; pectus whitish and brown ; legs purplish red with whitish streaks, the tarsi ringed with whitish ; abdomen whitish tinged with brown, the ventral surface purplish red. Fore wing with the costal and terminal areas purplish red ; the rest of basal area brown with a whitish patch at base of inner margin ; the medial area obliquely whitish except towards costa ; an elongate black annulus with brownish centre in middle of cell conjoined to the dark basal area, and a whitish discoidal lunule open below : postmedial line blackish, arising below costa, incurved and with black patch beyond it to vein 4 where it is angled outwards, then again incurved ; the terminal area tinged with brown towards apex ; a series of small black spots on costa towards apex and on termen which is whitish. Hind wing white, the terminal area suffused with brown except towards tornus ; a series of small black spots on termen from apex to vein 2 ; cilia whitish ; the underside with the costal area and terminal area to vein 2 suffused with purplish red, black lunules before and beyond the discocellulars, a curved post-medial series of small black spots.

*Hab.* W. COLOMBIA, San Antonio (*Palmer*), 1 ♂ type. *Exp.* 30 mm.

(1 c) *Pionea distictalis*, sp. n.

Antennæ of male bipectinate with short branches ; mid tibiæ not dilated ; hind tibiæ with the spurs well developed.

♂. Head and thorax brown with a cupreous gloss; palpi at base, pectus, and legs whitish, the fore tibiae fuscous; abdomen whitish tinged with brown. Fore wing brown with a cupreous gloss; a rather diffused and slightly sinuous dark antemedial line from cell to inner margin; a rounded ochreous-white spot in upper angle of cell; an oblique sinuous rather diffused dark postmedial line from vein 3 to inner margin; a conical ochreous-white postmedial patch from costa to vein 5, somewhat constricted at middle and defined by fuscous; cilia pale brown. Hind wing whitish tinged with brown especially on apical part of termen; the underside with slight dark point at upper angle of cell, a slight postmedial line from costa to vein 5, where there is a dark spot and another at middle of submedian fold.

*Hab.* COLOMBIA, Sierra del Libane, 6000' (H. H. Smith), 1 ♂ type. *Exp.* 25 mm.

(1e) *Pionea albiluna*, sp. n.

Antennæ of male with the shaft laminate and with ridges of scales above.

♂. Head and thorax reddish brown; palpi black, white below at base; pectus and legs creamy white, the fore tibiae with blackish band at extremity; abdomen whitish, dorsally suffused with brown. Fore wing dull brown; an indistinct dark antemedial line, oblique from costa to submedian fold; an oblique white discoidal lunule defined by blackish except above, where it is confluent with a yellow spot on costa; an indistinct dark line from lower angle of cell to inner margin, bent inwards to submedian fold, then slightly excurved. Hind wing white faintly tinged with brown, the terminal area suffused with brown; the underside with the costal area suffused with brown, a black discoidal spot, a slight brown postmedial line, angled inwards and with brown spot on it at discal fold, then oblique to submedian fold where it terminates.

*Hab.* W. COLOMBIA, San Antonio (Palmer), 1 ♂ type. *Exp.* 22 mm.

(1f) *Pionea dichorda*, sp. n.

♀. Head and thorax whitish suffused with rufous; palpi rufous, the third joint with black ring at base; sides of frons blackish; fore tibiae blackish above; abdomen whitish tinged with rufous. Fore wing whitish tinged with rufous, the costal area suffused with purplish red; a small blackish spot in cell before the strong black antemedial line which is



bent inwards to costa; a blackish discoidal bar; a strong oblique black postmedial line; the costa towards apex and termen with series of small black spots. Hind wing white faintly tinged with rufous; a terminal series of small black spots from apex to vein 2; the underside with small black spots in middle of cell and on discocellulars, an oblique maculate postmedial line from costa to submedian fold.

*Hab.* W. COLOMBIA, San Antonio (*Palmer*), 1 ♀ type. *Exp.* 16 mm.

(2 a) *Pionea nephelistalis*, sp. n.

♀. Head and thorax yellow tinged with brown; pectus and legs whitish; abdomen yellow dorsally suffused with brown. Fore wing pale yellow, the medial area suffused with brown except towards costa; an inwardly oblique diffused black antemedial line from cell to inner margin; a black point in middle of cell and slight discoidal lunule; postmedial line formed of small wedge-shaped black marks not extending to costa, excurved to vein 4, then very oblique, with a diffused dark maculate band beyond it from below costa to vein 3 and a patch above inner margin. Hind wing pale yellow suffused with brown to beyond postmedial line except on costal area which is whitish, the postmedial line indistinct, pale, curved, defined on inner side by deeper brown and with a diffused band beyond it; the underside pale yellowish with diffused curved brown postmedial line.

*Hab.* C. CHINA, Ichang (*Mrs. Pratt*), 1 ♀ type. *Exp.* 26 mm.

(10 a) *Pionea fovifera*, sp. n.

Fore wing of male with large fovea below base of cell on upperside; hind wing with the costa strongly lobed at base.

♂. Head and thorax white suffused with reddish brown; pectus, legs, and abdomen white. Fore wing white suffused with reddish brown; a slight dentate excurved blackish antemedial line from below costa to beyond the fovea; a slight blackish discoidal lunule; postmedial line very indistinct, blackish, minutely dentate, excurved from costa to vein 4 then oblique; a terminal series of black points. Hind wing white faintly tinged with brown.

*Hab.* CUBA, Santiago (*Schaus*), 1 ♂ type. *Exp.* 14 mm.

(34 a) *Pionea nomophilodes*, sp. n.

Palpi about three times length of head.

Head and thorax pale red-brown; palpi white below; legs pale red-brown; pectus and abdomen brownish white. Fore wing white tinged with pale red-brown, especially on costal area; a minute black point in middle of cell and discoidal point just above lower angle of cell; a terminal series of minute black points. Hind wing white faintly tinged with red-brown; a terminal series of minute black points.

*Hab.* CHILI, Mulchen (*Elves*), 1 ♂, 1 ♀ type. *Exp.* 22 mm.

(34 c) *Pionea melanephra*, sp. n.

♀. Head, thorax, and abdomen ochreous; palpi black below; antennae brownish; fore tibiae with black band at extremity, the tarsi banded with blackish. Fore wing ochreous, irrorated with a few blackish scales; an indistinct sinuous dark antemedial line; a faint brown annulus in middle of cell and prominent black discoidal lunule with slight brown striga in centre, a black point above it on costa; postmedial line with black spot at costa, then slight and with series of black points on it, incurved and with small black spot at discal fold, below vein 4 bent inwards to below end of cell, then again excurved; the terminal area, suffused with rufous; a series of black points on costa towards apex and on termen. Hind wing creamy white, the terminal area tinged with rufous from costa to vein 2; a small black spot at upper angle of cell and point at lower angle; a terminal series of points from apex to vein 2; the underside with postmedial series of small black spots excurved between veins 4 and 2.

*Hab.* W. COLOMBIA, San Antonio (*Palmer*), 1 ♀ type. *Exp.* 24 mm.

(35 b) *Pionea chalcitalis*, sp. n.

♂. Head and thorax cupreous yellow almost entirely suffused with black; palpi whitish at base; legs yellow marked with black; abdomen whitish tinged with cupreous and dorsally suffused with black forming diffused bands except at base. Fore wing cupreous yellow suffused with black except at base of inner margin, on medial costal area, and terminal area; a triangular yellow antemedial patch from costa with indistinct diffused black line from it to inner margin; a small round white spot defined by black in upper angle of cell connected with the yellow costal area; a triangular postmedial yellow patch from costa with three white points below it, a diffused black patch beyond them

and a diffused incurved dark line from them to inner margin with yellow marks on inner side above and below vein 2; some small black spots on costa towards apex; a terminal series of black points. Hind wing white, the inner area tinged with brown; the terminal area slightly tinged with brown from apex to vein 2; a terminal series of black points; cilia yellow; the underside with the costal area irrorated with brown, the terminal area tinged with brown, black spots in and beyond end of cell, and a maculate curved postmedial line.

*Hab.* COLOMBIA, Sierra del Libane, 6000' (*H. H. Smith*), 1 ♂ type. *Exp.* 24 mm.

(35 c) *Pionea obvialis*, sp. n.

♂. Head and thorax red-brown mixed with some ochreous; palpi at base, pectus, and legs more ochreous; abdomen red-brown with dorsal blackish bands more prominent on the two basal segments, the ventral surface ochreous suffused with red-brown and with sublateral series of small black spots. Fore wing red-brown slightly mixed with ochreous; a strong oblique black antemedial line from cell to inner margin and a strong black postmedial line very oblique below vein 4, the area between them yellowish on inner half; a small hyaline spot in upper part of end of cell defined by black, and a similar spot above vein 6 before the postmedial line, with a black line from it to vein 5; the termen and base of cilia narrowly yellowish with a terminal series of blackish points. Hind wing yellowish white, the terminal area suffused with brown except towards tornus; the underside with the costal area suffused with red-brown, small black spots in and beyond upper angle of cell and a slight postmedial line somewhat excurved at vein 5 and with small blackish spot at discal fold.

*Hab.* PERU, Cerro del Paseo, Huancabamba, 1 ♂ type. *Exp.* 20 mm.

(36 a) *Pionea ænealis*, sp. n.

♂. Head and thorax brassy yellow suffused with fuscous brown; palpi black, white below; pectus and legs whitish marked with fuscous; abdomen white with dorsal series of blackish bands and ventral series of small black spots. Fore wing brassy yellow irrorated with brown; a black antemedial line curved inwards to costa with an oblique whitish bar on its outer edge in cell; a white discoidal bar defined by black at sides and constricted at middle; a black postmedial line with whitish band on inner side from costa to

vein 5, defined on inner side by a fine black line except at costa, the postmedial line strong, diffused and obliquely incurved below vein 5; a terminal series of prominent black points. Hind wing white with terminal series of small black spots; the underside with the costal and apical part of terminal area tinged with brown, black spots in and beyond end of cell, a curved postmedial series of small black spots.

*Hab.* COLOMBIA, Sierra del Libane, 6000' (*H. H. Smith*), 1 ♂ type. *Exp.* 24 mm.

(37 a) *Pionea luniferalis*, sp. n.

♀. Head, thorax, and abdomen brown with an æneous gloss; palpi at base, pectus, legs, and abdomen white, the fore tibiae banded with brown. Fore wing brown with an æneous gloss; an indistinct, oblique, rather diffused, fuscous antemedial line; a rather lunulate postmedial yellow patch from costa to vein 5 with the indistinct diffused postmedial line on its outer edge, strongly incurved below vein 5; apical part of costa yellowish with slight brown spots; apical half of cilia yellow with small brown spots at base. Hind wing pale brown with an æneous gloss; cilia yellow with a brown line at base; the underside white tinged with brown especially on terminal area, a slight spot at upper angle of cell and curved postmedial line.

*Hab.* BRAZIL, Organ Mts., Tijuca (*Wagner*), 1 ♀ type. *Exp.* 24 mm.

(38 a) *Pionea ochropera*, sp. n.

♂. Head and thorax ochreous tinged with rufous and mixed with dark brown; pectus whitish; fore tibiae with black band near extremity; abdomen white dorsally suffused with dark brown leaving white segmental lines. Fore wing ochreous irrorated with dark brown and suffused with purplish fuscous except on costal area and inner margin, the apical area ochreous, with a dark streak below vein 8; antemedial line blackish, angled outwards below costa and bent outwards to inner margin; a black annulus in middle of cell and narrow elliptical discoidal annulus defined by black; postmedial line blackish slightly defined on outer side by ochreous, obliquely downcurved to vein 6, excurved and slightly waved to vein 2, then bent inwards to below end of cell and again excurved; some small black spots on costa towards apex; a blackish terminal line with ochreous points at the veins. Hind wing semihyaline white; black



points at angles of cell; the apical area and termen to vein 2 suffused with brown; the termen with blackish points to submedian fold; cilia white with a dark line near base; the underside with the costal area slightly irrorated with blackish, small black spots in end of cell and on discocellulars and a point at lower angle, three postmedial black points from costa to discal fold, then traces of a curved punctiform line to submedian fold where there is a black point, a terminal series of black points.

*Hab.* COLOMBIA, Sierra del Labano (*H. H. Smith*), 1 ♂ type. *Exp.* 26 mm.

(386) *Pionea nigribasalis*, sp. n.

♂. Head, thorax, and abdomen brown strongly suffused with black; antennæ ringed black and white; pectus and legs paler, the tibiæ and tarsi banded with black. Fore wing greyish, the basal area strongly suffused with black, the rest of wing with red-brown; the basal area bounded by a slight pale somewhat incurved antemedial line strongly defined by black on outer side; a pale discoidal spot defined by brown, rounded above and acuminate below with a semi-circular black mark above it on costa; postmedial line black, dilated into a spot on costa, oblique to vein 6, then inwardly oblique and waved, at vein 3 retracted to below angle of cell, then again excurved, some deep brown suffusion beyond it on costal area and from middle to inner margin; a sub-terminal black spot above middle; some black points on costa towards apex and a terminal series with blackish spot at apex; cilia black with greyish tips. Hind wing greyish suffused with fuscous brown, the apical part of terminal area darker; an indistinct curved postmedial line; cilia brown at base, greyish at tips; the underside greyish irrorated with brown, a slight black streak in cell near base and discoidal spot, a sinuous postmedial line defined by a whitish band on outer side, the terminal area fuscous.

*Hab.* BR. E. AFRICA, Kikuyu, Roromo (*Crawshay*), 1 ♂ type. *Exp.* 18 mm.

(38 b) *Pionea muscosalis*, sp. n.

Head and thorax sap-green mixed with some whitish and black scales; palpi whitish below and with black spot on second joint; antennæ brownish white ringed with black; pectus and legs brownish white, the tarsi ringed with fuscous; abdomen ochreous brown with slight whitish segmental rings. Fore wing sap-green slightly irrorated with

black, some deep rufous and blackish suffusion below and beyond end of cell, and at base of inner margin; a diffused blackish subbasal line; antemedial line black, oblique, slightly sinuous; the terminal half of costa with black striae with pale brown between them; postmedial line white, defined on inner and outer sides by series of black points, slightly excurved below costa and at middle; a terminal white line with series of black points on it and black spot on its inner edge at discal fold; cilia pale brown mixed with fuscous and with whitish tips. Hind wing fuscous brown, the cilia greyish with dark line near base; the underside whitish tinged with brown, small black spots at angles of cell, postmedial spots on costa and in discal fold and a terminal series of striae.

Ab. 1. Fore wing with the antemedial line defined by white on inner side except at costa, and with large patch beyond it below the cell.

*Hab.* TRANSVAAL, Lekkerwater Kloof (*Janse*), 3 ♂, 1 ♀ type. *Exp.* 20 mm.

(50 a) *Pionea squamosa*, sp. n.

♀. Head, thorax, and abdomen white mixed with pale brown. Fore wing white tinged with pale grey-brown and irrorated with large white black-tipped scales forming obscure bars on and beyond the discocellulars; an indistinct waved dark antemedial line; small white and dark spots on costa just before and beyond end of cell; postmedial line dark, defined on outer side by white towards costa, minutely dentate, oblique from costa to discal fold, then inwardly oblique; a fine blackish terminal line; cilia with a fine white line near tips. Hind wing white tinged with brown; a punctiform black terminal line from apex to vein 2; the underside white, the costal area and submedian fold irrorated with brown, a dark postmedial shade from costa to vein 5.

*Hab.* CAPE COLONY, Deelfontein (*Sloggett*), 1 ♀ type. *Exp.* 16 mm.

(50 b) *Pionea epiphænicealis*, sp. n.

♂. Head and thorax red-brown; palpi below, pectus, and legs white; abdomen grey-brown with slight pale segmental lines. Fore wing brown shot with purple and with slight dark irroration; traces of a dark antemedial line slightly angled outwards at median nervure; an indistinct dark spot in middle of cell and discoidal lunule; traces of a medial line, oblique towards costa and excurved beyond lower angle

of cell between vein 5 and submedian fold; postmedial line dark slightly defined by ochreous on outer side, minutely dentate, oblique towards costa, excurved between veins 6 and 3, then somewhat retracted; a terminal series of black points; cilia ochreous. Hind wing cupreous brown with a slight dark terminal line; cilia yellowish white with a fine dark line near base; the underside ochreous white with dark discoidal lunule, minutely dentate postmedial line excurved at middle and terminal series of black striæ.

*Hab.* SIERRA LEONE (*Clements*), 2 ♂ type. *Exp.* 22 mm.

(55 a) *Pionea leptidalis*, sp. n.

♂. Head, thorax, and abdomen pale reddish brown; palpi dark brown, white at base; pectus, legs, and ventral surface of abdomen whitish. Fore wing pale reddish brown with slight dark irroration; antemedial line indistinct, fuscous, rather diffused, very oblique from costa to median nervure, then slightly incurved; a dark discoidal lunule with slight pale spot beyond it; postmedial line indistinct, excurved and slightly waved between veins 6 and 2 where it is retracted to below angle of cell, then bent outwards again; a terminal series of black points. Hind wing white, the termen tinged with brown and with a series of black points from apex to submedian fold; the underside with curved postmedial series of small brown spots from costa to vein 3.

*Hab.* PARAGUAY, Sapucay (*Foster*), 1 ♂ type. *Exp.* 22 mm.

(56 a) *Pionea diopsalis*, sp. n.

Head and thorax pale rufous; palpi white at base; pectus and legs white slightly tinged with rufous; abdomen white tinged with rufous towards extremity. Fore wing pale rufous, the inner area whitish; irrorated with a few black scales; antemedial line absent; orbicular and reniform grey defined by fuscous, the former round, the latter irregularly quadrate; the terminal half of costa with series of small dark spots; postmedial line with series of black points and traces of a minutely dentate line between them, slightly excurved from costa to vein 4, then oblique; a terminal series of prominent black points; cilia greyish fuscous with fine dark line near base. Hind wing white, the terminal area tinged with brown; a fine sinuous postmedial line from costa to vein 3; a terminal series of black points; cilia with a fine dark line near base; the underside irrorated with



fuscous, a dark spot at upper angle of cell and point at lower angle, a maculate sinuous postmedial line.

Ab. 1. Fore wing with the orbicular and reniform deep black.

*Hab.* CHILI, Mulchen (*Elwes*), 1 ♂, 2 ♀ type. *Exp.* 24 mm.

(58 a) *Pionea hæmatalis*, sp. n.

Head, thorax, and abdomen yellow suffused with fiery crimson; palpi brown, white below; throat white; fore tibiæ brown banded with white, the tarsi white; mid tibiæ below and tarsi white. Fore wing yellow, the costal area, base, streaks on the veins, and diffused lines fiery crimson covering most of wing, the costa tinged with brown; the diffused antemedial line somewhat oblique and sinuous; a small brownish spot in middle of cell and discoidal lunule; postmedial line minutely dentate, oblique from costa to vein 5, at vein 2 retracted to lower angle of cell, then somewhat oblique to inner margin; a minutely waved, curved subterminal line; termen suffused with red; cilia brown. Hind wing yellow, the veins streaked with fiery red; a diffused streak on vein 1; diffused spots at origin of vein 2 and lower angle of cell; a minutely waved postmedial line oblique from costa, at vein 2 retracted to the spot at lower angle of cell, then oblique to inner margin; a minutely waved, curved subterminal line; termen suffused with red; cilia brown; the underside yellow with indistinct reddish postmedial and subterminal lines.

*Hab.* BR. NEW GUINEA, Mt. Kebea (*Pratt*), 1 ♂ type, Dinawa, 1 ♀, Mafalu, 1 ♀, Ekeikei, 2 ♀. *Exp.* 30 mm.

(62 a) *Pionea xanthographa*, sp. n.

♀. Head and thorax pale yellow; palpi and sides of frons rufous, the former white at base; pectus, tibiæ, and tarsi white; abdomen white slightly tinged with ochreous. Fore wing pale yellow, the costa tinged with rufous to beyond middle; a nearly straight orange antemedial line; an orange discoidal bar; postmedial line orange, very slightly excurved from below costa to vein 3, then bent inwards to lower angle of cell and again slightly excurved; a fine dark terminal line; cilia white at tips. Hind wing pale yellow; an oblique orange antemedial line from middle of cell to inner margin; an oblique orange postmedial line from below costa to tornus; the termen whitish defined on inner side by an orange line; a fine dark terminal line; cilia orange at base, whitish at tips; the underside uniformly whitish.

*Hab.* S. NIGERIA, Lagos (*Boag*), 1 ♀ type. *Exp.* 22 mm.



(63 a) \**Pionea ignitalis*, sp. n.

♀. Head and thorax deep red-brown; base of palpi and antennæ, sides of frons, and throat pure white; tarsi white; abdomen paler brown. Fore wing with the basal and costal areas brown, the rest of wing orange-brown suffused with brilliant purple-erimson; a curved yellow band just beyond middle from below costa to inner margin, dilated at lower angle of cell, enclosing some crimson spots and edged by red lines; cilia orange. Hind wing orange with the area between submedian fold and vein 5 suffused with crimson, crossed by an oblique yellow postmedial band outwardly edged with red; the termen black at apex, purple at middle; the tornus truncate.

*Hab.* NIGER R., Warri (*Roth*). *Exp.* 18 mm. Type in Coll. Rothschild.

(76 a) *Pionea mesophæalis*, sp. n.

♂. Head and thorax orange-yellow; palpi at base, pectus, legs, and abdomen whitish, the anal tuft yellow. Fore wing yellow irrorated with fuscous brown, except inner basal area, the basal costal area and medial area slightly darker; a rather diffused straight erect antemedial fuscous line; a slight pale spot at lower angle of cell; a strong fuscous postmedial line, excurved below costa, then curved inwards to below angle of cell and straight to inner margin; a slight diffused dark terminal band; cilia pale yellow. Hind wing white, the terminal area slightly tinged with ochreous; an indistinct curved dark postmedial line except towards inner margin; the underside with the costal area suffused with brown.

*Hab.* BR. E. AFRICA, Kikuyu, Roromo (*Crawshay*), 1 ♂ type. *Exp.* 30 mm.

(82 a) *Pionea ectophæalis*, sp. n.

♀. Pale lemon-yellow; palpi rufous, white below; pectus and legs white; abdomen white dorsally tinged with yellow. Fore wing with the costal edge brown; the termen narrowly brown, the cilia brown at base, white at tips. Hind wing with a terminal line and base of cilia brown from apex to vein 2, the rest of cilia white.

*Hab.* AMBOINA (*Doherty*), 1 ♀ type. *Exp.* 22 mm.

(82 b) *Pionea brunneiciliaris*, sp. n.

♂. Fulvous yellow; tibiæ and tarsi whitish. Fore wing

with the costal and terminal areas rather deeper fulvous, the costal edge brown; a slightly waved antemedial fulvous line, oblique from costa to submedian fold; a slight discoidal lunule; postmedial line minutely waved, excurved from costa to vein 2, then retracted to below angle of cell and rather oblique to inner margin; a fine terminal dark line; cilia brown at base, ochreous white at tips. Hind wing rather paler except terminal area; faint traces of a postmedial line between veins 5 and 2; the termen narrowly brown and the cilia brown at base from apex to vein 2, the rest of cilia ochreous white. Underside with the costal area of fore wing and the hind wing whitish.

*Hab.* BATCHIAN (*Doherty*), 1 ♂ type. *Exp.* 24 mm.

(90 a) *Pionea teinopalpia*, sp. n.

Palpi about three times length of head.

♂. Head and thorax ochreous yellow; palpi and frons at sides red-brown; tegulae and patagia tinged with rufous on outer edge; pectus and legs white, the fore legs brown in front; abdomen white, dorsally suffused with reddish ochreous. Fore wing ochreous yellow, the costal half of wing suffused with red-brown, the terminal area with rufous, the medial inner area irrorated with brown; traces of a very oblique antemedial brown line from costa to origin of vein 2, then an inwardly oblique series of three small black spots between the cell and vein 1; a brownish fascia on extremity of median nervure and vein 4 to the postmedial line, which is represented by a series of blackish points, excurved below costa, then oblique and angled inwards on vein 2; cilia brownish, with a dark line at middle. Hind wing white, with a faint ochreous tinge, especially on apical area; the termen with minute rufous points from apex to vein 2; the underside with the costal area tinged with ochreous, a curved brown postmedial line with dark points at the veins from costa to vein 2.

*Hab.* PERU, Oconeque (*Ockenden*), 1 ♂ type. *Exp.* 34 mm.

(90 b) *Pionea melastictalis*, sp. n.

♂. Head and thorax pale yellow suffused in parts with red-brown; palpi red-brown, white at base; pectus and mid and hind legs white; fore legs brown; abdomen pale yellow, dorsally slightly tinged with brown. Fore wing pale yellow, the veins and costal edge streaked with red-brown;

antemedial line formed of short dark streaks from subcostal nervure to submedian fold, where it is angled, then oblique to inner margin; a streak in end of cell; a discoidal lunule conjoined by the almost confluent streaks on bases of veins 5 to 3 with the postmedial line, which is formed of short somewhat dentate black streaks, excurved from costa to vein 5, then very oblique, and ending in a curved brown streak below vein 1 to the antemedial line; a highly dentate brown subterminal line angled inwards at discal and submedian folds, at former to the postmedial line, the area beyond it brown except at apex; cilia brown, with a yellowish line at base. Hind wing semihyaline white, with curved postmedial series of slight fuscous spots in the interspaces from costa to vein 2, the underside with the costal area irrorated with brown, a dark spot in upper angle of cell, the postmedial series more prominent, a terminal series of black points from apex to vein 2.

*Hab.* PERU, Huancabamba, 1 ♂ type. *Exp.* 32 mm.

(103 a) *Pionea subcostalis*, sp. n.

♂. Head and front of thorax cupreous brown, the hinder part of thorax pale yellow; palpi white at base; antennæ with the shaft white above towards tips; pectus and legs white; abdomen cupreous brown, the ventral surface white. Fore wing pale yellow, with a broad cupreous brown fascia below costa, which is white, and a cupreous brown subterminal shade; a slight brown antemedial line from cell to inner margin; a brown discoidal spot on the subcostal fascia; a slight brown postmedial line, excurved between veins 5 and 2. Hind wing pale yellow; a small brown discoidal spot and slight postmedial line excurved between veins 5 and 2.

*Hab.* PERU, Pozuzo, 1 ♂ type. *Exp.* 24 mm.

(104 c) *Pionea erythralis*, sp. n.

♂. Yellow; head and thorax entirely suffused with deep red-brown; abdomen irrorated with rufous. Fore wing suffused with red-brown at base, on costal area to the postmedial line, and beyond the antemedial line, which is oblique from costa to below the cell and angled inwards on vein 1; a point in middle of cell and discoidal spot; the postmedial line very minutely dentate, curved from costa to vein 3, then inwardly oblique; a diffused subterminal dentate band.

Hind wing clear yellow, with slight fuscous subterminal line from costa to submedian fold.

♀. Head, thorax, abdomen, and fore wing entirely suffused with dull pink.

*Hab.* NIGERIA, Warri (*Roth*), Dogo (*Simpson*), 1 ♂ type, Zungeru (*Macfie*), 1 ♀; BR. C. AFRICA, Fort Johnston (*Rendall*), 1 ♀, Blantyre; NATAL, Durban (*Leigh*), 1 ♂, 1 ♀. *Exp.*, ♂ 24, ♀ 30 mm.

(114 a) *Pionea poliochroa*, sp. n.

♀. Head and thorax white tinged with pale red-brown; abdomen white. Fore wing white tinged and irrorated with pale red-brown; antemedial line hardly traceable except as a dark striga on inner area; traces of a quadrate brown spot in middle of cell and a rather more distinct elliptical discoidal spot; postmedial indistinct, dark, excurved from costa to vein 4, then oblique; traces of a dark subterminal shade; some minute dark points on termen except towards tornus. Hind wing white slightly irrorated with brown; a dark point at lower angle of cell; postmedial line slight, dark, minutely waved, excurved between veins 5 and 2; a series of obscure dark streaks in the interspaces of terminal area; some minute black points on apical part of termen.

*Hab.* SANDWICH IS., Oahu, Waialua (*Perkins*), 1 ♀ type. *Exp.* 20 mm.

(121 a) *Pionea piperitalis*, sp. n.

♀. Head and thorax yellow-brown mixed with whitish; palpi blackish at tips; abdomen white, the ventral surface slightly irrorated with fuscous, the anal tuft tinged with ochreous. Fore wing whitish thickly irrorated with fuscous, the costal area ochreous to beyond middle; the terminal area suffused and irrorated with fuscous, the apex and termen tinged with ochreous; an indistinct, diffused, curved, antemedial dark line defined on inner side by a whitish band except towards costa; a small quadrate white spot in upper angle of cell, with slight black striga on its inner edge and small lunule on outer; a diffused dark postmedial line, oblique and sinuous below vein 4, defined on outer side by a whitish band from vein 4 to inner margin; a terminal series of blackish points. Hind wing white, with rather narrow, diffused, brownish terminal band except towards tornus, irrorated with fuscous; a terminal series of blackish points except towards tornus; cilia brownish at base, whitish at tips; the underside with black point at upper angle of cell



and small diffused blackish postmedial spots at costa, discal fold, and towards inner margin.

*Hab.* BR. E. AFRICA, Udimu (*Betton*), 1 ♀ type. *Exp.* 26 mm.

(127 a) *Pionea phæalis*, sp. n.

♂. Dark reddish brown mixed with fuscous; palpi blackish, white below at base. Fore wing with small antemedial black spots below cell and on inner margin; a bisinuate discoidal black line defined by pale brownish on outer side; a small patch of blackish suffusion beyond lower angle of cell; postmedial line black, slightly excurved below costa, incurved at discal fold, excurved to vein 2, then retracted to below end of cell and again slightly excurved; a black terminal line; cilia with a strigiform black line at middle and blackish tips. Hind wing more fuscous brown, with terminal series of faint dark points; cilia paler, with blackish line near base; the underside with traces of diffused dark postmedial line on costal area.

*Hab.* BR. E. AFRICA, Kirbehs (*Betton*), 1 ♂ type. *Exp.* 20 mm.

(130) *Pionea secticostalis*, sp. n.

♀. Head, thorax, and abdomen cupreous brown; frons white at sides; palpi at base, pectus, legs, and ventral surface of abdomen white. Fore wing cupreous brown; traces of an oblique sinuous antemedial line, with a small white spot beyond it below costa; an indistinct dark discoidal lunule with small white spot in centre; the terminal third of costa with four short white streaks alternating with short black streaks; an indistinct postmedial line excurved from costa to vein 4, then incurved; some slight black points on apical half of costa. Hind wing pale cupreous brown, with traces of a curved postmedial line and fine terminal line; the underside grey-brown, with two obliquely placed discoidal points, a highly curved punctiform postmedial line, and terminal series of black points or striæ.

*Hab.* PARAGUAY, Sapucay (*Foster*), 2 ♀ type. *Exp.* 18 mm.

(128 a) *Pionea monospila*, sp. n.

♀. Head, thorax, and abdomen cupreous brown mixed with some grey; pectus and ventral surface of abdomen whitish; tarsi ringed with white. Fore wing cupreous

brown irrorated with a few white scales ; a postmedial white spot on costa. Hind wing cupreous brown.

*Hab.* BRAZIL, Petropolis (*Doer*), 1 ♀ type. *Exp.* 14 mm.

(140 a) *Pionea leucozonea*, sp. n.

♂. Head and thorax white mixed with bronze-brown ; abdomen white dorsally tinged with brown, leaving white segmental lines ; pectus and legs white. Fore wing whitish suffused with bronze-brown and irrorated with blackish ; a pure white antemedial band narrowing to costa ; a quadrate white patch in end of cell confluent with a patch above it on costa, a small semicircular blackish mark before it in middle of cell, and a blackish discoidal lunule with white centre ; a white spot on costa beyond the cell ; a white postmedial band, narrowing and sinuous between veins 6 and 2, then retracted to lower angle of cell and forming an oblique white band to inner margin ; a terminal series of small dark spots. Hind wing white tinged with bronze-brown except on costal area to beyond middle ; a dark discoidal point ; a brown postmedial line defined on outer side by whitish, bent outwards between veins 5 and 2 ; a terminal series of dark points ; the underside white, a blackish point in middle of cell and small discoidal lunule, the postmedial line with some blackish points on it, the terminal points black.

*Hab.* SANDWICH Is., Hawaii, Kilauea (*Perkins*), 1 ♂ type. *Exp.* 16 mm.

(3) *Paratalanta griseicinctalis*, sp. n.

Mid tibia of male without fold and tuft, hind tibia with the inner medial spur minute ; fore wing without costal fold ; hind wing with the termen evenly curved.

♂. Head and thorax brown mixed with whitish ; palpi white below ; pectus and legs whitish ; abdomen white dorsally tinged with brown. Fore wing whitish suffused with cupreous brown, leaving the terminal area white ; an indistinct brown antemedial line oblique from costa to below the cell ; a brown spot in middle of cell and discoidal spot with whitish centre ; an indistinct postmedial line excurved from costa to vein 2, then bent inwards to below end of cell and erect to inner margin, closely approximated at middle to the indistinct subterminal line, which is rather maculate towards costa. Hind wing semihyaline whitish, the disk tinged with cupreous brown, the terminal area whiter ; a slight dark discoidal bar ; postmedial line bent outwards between veins 5

and 2, then retracted to below angle of cell and oblique to above inner margin; a subterminal line slightly excurved between veins 5 and 2.

*Hab.* BAHAMAS (*Bonhote*), 2 ♂ type. *Exp.* 32 mm.

(4b) *Pyrausta glaucoleuca*, sp. n.

Fore coxæ of male with tuft of long fuscous scales below, the femora with tuft of long fulvous hair above; abdomen with ventral fan of scales on penultimate segment.

♂. Head, thorax, and abdomen grey-brown, the vertex of head whitish; palpi dark brown, white below; pectus, legs, and ventral surface of abdomen white slightly tinged with rufous. Fore wing silky grey-brown; a faint, dark, minutely waved postmedial line, excurved below costa and at middle, retracted below vein 2; cilia with a fine yellowish line at base, blackish at middle and with white tips. Hind wing pure white, with a fine brown terminal line.

*Hab.* S.E. PERU, La Oroya (*Ockenden*), 2 ♂ type. *Exp.* 26 mm.

(8a) *Pyrausta albicostalis*, sp. n.

♂. Head and thorax yellow; palpi fulvous, white at base; sides of frons with white lines; shoulders fulvous; pectus and legs white, the fore femora and tibiæ and mid femora fulvous; abdomen white. Fore wing yellow, the costal area fulvous, with the costal edge white, the veins deeper yellow; traces of a curved yellow antemedial line and of a postmedial line excurved from costa to vein 5, then oblique; cilia whitish. Hind wing white, with fine yellowish terminal line.

*Hab.* BRAZIL, Organ Mts., Tijuca (*Wagner*), 1 ♂ type. *Exp.* 28 mm.

(12a) *Pyrausta perflavalis*, sp. n.

♂. Head and thorax bright yellow; palpi fulvous, white below; frons with fine lateral white streaks; pectus and legs white, the fore tibiæ yellow in front; abdomen white, dorsally suffused with yellow. Fore wing bright yellow, the costal edge narrowly brown; an indistinct orange antemedial line, oblique from costa to submedian fold; a slight discoidal bar; postmedial line indistinct, excurved from costa to vein 2, then retracted to lower angle of cell; cilia brown, white at tips. Hind wing rather paler yellow except towards termen; cilia brown from apex to vein 2.

*Hab.* FERGUSSON I. (Meek), 1 ♂ type; QUEENSLAND, Mt. Tambourine, 1 ♂. *Exp.* 24 mm.

(16 a) *Pyrausta atricinctalis*, sp. n.

♀. Golden yellow; palpi blackish at tips; maxillary palpi black at tips. Fore wing with round black discoidal spot; a narrow black terminal band, rather broader and diffused on inner side towards apex; cilia black. Hind wing with narrow black terminal band and the cilia black from apex to vein 2.

*Hab.* MASHONALAND (Dobbie), 1 ♀ type. *Exp.* 26 mm.

(20 a) *Pyrausta peruvialis*, sp. n.

Head and thorax ochreous slightly tinged with rufous; palpi and sides of frons rufous, the former white at base; fore legs rufous; abdomen ochreous white. Fore wing ochreous, the costal area slightly tinged with rufous; an indistinct oblique sinuous antemedial line; a faint dark spot in middle of cell and discoidal bar; postmedial line indistinct, dark, excurved and minutely dentate from vein 6 to 3, then retracted to below end of cell and sinuous to inner margin; a terminal series of slight dark striae. Hind wing ochreous white; an indistinct brownish postmedial line, excurved and minutely waved between veins 5 and 2, then obsolete; traces of a somewhat diffused subterminal line from costa to vein 2 and of a fine terminal line.

*Hab.* JAPAN, Satsuma (Leech), 2 ♂ type, Nagasaki (Leech), 1 ♀; C. CHINA, Ningpo, 1 ♀, Foochow (Leech), 1 ♂, 1 ♀, Kiukiang (Pratt), 1 ♂; W. CHINA, Chang-yang (Pratt), 1 ♂. *Exp.* 26-30 mm.

(30 a) *Pyrausta thermicruralis*, sp. n.

Bright straw-yellow; palpi rufous, white below; sides of frons and shoulders tinged with rufous; pectus and legs white, the femora rufous, fore tibiae rufous at extremities, the mid tibiae rufous above. Fore wing with the costal area slightly tinged with rufous; a slightly sinuous antemedial rufous line bent inwards to costa; a discoidal lunule; postmedial line arising from below costa, excurved and minutely waved to vein 3, on which is an oblique streak connecting it with lower angle of cell, then bent inwards to below angle of cell and erect to inner margin; a rufous terminal line and the cilia rufous. Hind wing with slight oblique postmedial



line between veins 5 and 2 ; a terminal rufous line and the cilia rufous from apex to vein 2.

*Hab.* PARAGUAY, Sapucay (*Foster*), 4 ♂, 1 ♀ type. *Exp.* 32-36 mm.

(31 a) *Pyrausta straminea*, sp. n.

*Epicorsia butyroga*, Druce, Biol. Centr.-Am., Het. ii. p. 212 (part.), nec Guen.

♂. Head, thorax, and abdomen ochreous faintly tinged with rufous ; palpi white at base ; mid tibiæ white in front. Fore wing ochreous, the costal area faintly tinged with rufous towards base ; antemedial line indistinct, oblique to submedian fold and incurved above inner margin ; a slight discoidal striga ; postmedial line indistinct, minutely waved, excurved to vein 2, then retracted to below end of cell and again excurved. Hind wing ochreous ; an indistinct postmedial line, oblique and slightly waved to vein 2, then retracted to lower angle of cell and oblique to above tornus ; a brownish terminal line.

*Hab.* MEXICO, Presidio (*Forrer*), 1 ♂ type, Godman-Salvin Coll. *Exp.* 34 mm.

(31 b) *Pyrausta furvalis*, sp. n.

♀. Head, thorax, and abdomen fulvous red ; palpi white below ; fore coxæ in front, mid tibiæ at sides, and the tarsi white ; pectus and ventral surface of abdomen brown. Fore wing fulvous red ; an indistinct dark antemedial line, oblique to submedian fold and incurved above inner margin ; a faint dark point in middle of cell and discoidal lunule ; postmedial line indistinct, dark, excurved and waved from below costa to vein 3, then retracted to below end of cell ; cilia brown. Hind wing orange-red ; a very indistinct curved postmedial line between veins 5 and 2 ; cilia brownish.

*Hab.* W. COLOMBIA, Jimenez, 1 ♀ type. *Exp.* 32 mm.

(32 a) *Pyrausta holoxuthalis*, sp. n.

♂. Deep straw-yellow ; head and tegulae tinged with orange ; palpi fulvous, white below ; tibiæ and tarsi whitish. Fore wing with the costal area tinged with orange towards base. Hind wing with the cilia whitish. Underside of fore wing with the costal area tinged with fuscous, traces of a pale curved postmedial line ; hind wing faintly tinged with fuscous, traces of a pale postmedial band.

*Hab.* C. CHINA, Ichang (*Mrs. Pratt*), 1 ♂ type. *Exp.* 30 mm.

(34 a) *Pyrausta hæmaproctis*, sp. n.

♂. Head and tegulae pale brown; thorax grey; palpi dark brown above, white below; pectus white; legs white tinged with brown, the fore tibiae with brown band at extremity; abdomen pale brown, the anal tuft crimson, the ventral surface white. Fore wing pale grey-brown, the lower part of cell and the area below it to submedian fold white; a minute dark discoidal lunule; postmedial line indistinct, dark, excurved to vein 4, then oblique; cilia with a fine whitish line at base and whitish tips. Hind wing pale grey-brown, the basal and inner areas whitish; traces of a dark postmedial line from costa to vein 4; cilia with a fine white line at base and whitish tips; the underside whitish, with the postmedial line more distinct.

*Hab.* S.E. PERU, La Oroya (*Ockenden*), 1 ♂ type. *Exp.* 28 mm.

(35 a) *Pyrausta melanocera*, sp. n.

Fore wing with slight subbasal fovea in cell.

♂. Head, thorax, and abdomen ochreous yellow; antennae black except basal joint. Fore wing ochreous yellow, the costal edge brownish. Hind wing pale ochreous yellow.

*Hab.* N. NIGERIA, Minna (*Macfie*), 1 ♂ type. *Exp.* 20 mm.

(37 a) *Pyrausta metaleuca*, sp. n.

♂. Head, thorax, and abdomen pale brown; legs streaked whitish and brown; abdomen with the ventral surface whitish. Fore wing pale reddish brown; traces of a curved dark antemedial line; a slight dark spot in upper part of cell towards extremity and discoidal lunule; traces of a dark postmedial line excurved from below costa to vein 4, then oblique; a fine pale line at base of cilia. Hind wing white, the costa and termen with a faint brownish tinge; a terminal series of black striæ from apex to vein 1; the underside white faintly tinged with brown, a dark discoidal point, a postmedial punctiform line slightly excurved below discal fold, a terminal series of black points.

*Hab.* GERM. E. AFRICA, Kiliman'jaro (*Sjöstedt*), 1 ♂ type. *Exp.* 30 mm.

(43 a) *Pyrausta achroalis*, sp. n.

♀. Head, thorax, and abdomen white faintly tinged with rufous; sides of palpi and frons rufous; fore tibiae with brown band at extremity. Fore wing white faintly tinged

with rufous ; traces of an oblique dark antemedial line ; a black point in upper part of middle of cell and a discoidal bar ; postmedial line very indistinct, dark, excurved from vein 6 to 2, then bent inwards to below end of cell ; the termen rufous, with a series of dark points on it. Hind wing white faintly tinged with rufous ; an oblique black discoidal bar ; traces of a dark postmedial line excurved from vein 6 to 2, then bent inwards to near lower angle of cell and obliquely excurved to inner margin ; a fine rufous terminal line.

*Hab.* JAMAICA, Runaway Bay (*Walsingham*), 1 ♀ type ; CUBA, Santiago (*Schaus*), 1 ♀. *Exp.* 22 mm.

(61 a) *Pyrausta phœnizonalis*, sp. n.

Head and thorax ochreous yellow ; palpi rufous, white below ; throat white ; fore tibiæ white, tinged with fuscous at extremity ; abdomen ochreous. Fore wing ochreous yellow, the base and costal area to beyond middle tinged with rufous ; an antemedial brown line, oblique from costa to submedian fold, then incurved ; a small spot in middle of cell ; a lunulate discoidal spot with yellow lunule in middle ; a brown lunule beyond the cell with the postmedial line arising from it, faint and excurved to vein 2, then retracted to median nervure, strong and slightly incurved from near origin of vein 2 to inner margin ; a broad purplish-grey terminal band with dark brown inner edge, angled outwards below costa and inwards in discal fold, then excurved to vein 2, where it expands inwards to the angle of postmedial line ; cilia pale yellow. Hind wing ochreous yellow ; a small black discoidal spot ; a brown postmedial line bent outwards between veins 5 and 2, then retracted to below angle of cell, and slightly excurved to inner margin ; a broad purplish-grey terminal band with dark brown inner edge, angled inwards at discal fold, then minutely waved, and expanding inwards at vein 2 ; cilia pale yellow.

*Hab.* JAPAN, Hakodaté (*Leech*), 1 ♂, 1 ♀ type. *Exp.* 26 mm.

(73 a) *Pyrausta rufitincta*, sp. n.

♂. Head and thorax ochreous tinged with rufous ; palpi rufous, white at base ; pectus and legs white, the fore tibiæ with rufous band at extremity ; abdomen white dorsally faintly tinged with rufous. Fore wing ochreous tinged with rufous ; a slight rufous discoidal lunule ; postmedial line rufous, minutely waved, excurved from below costa to vein 2,

then bent inwards ; a punctiform rufous terminal line ; cilia with a rufous line at middle and white tips. Hind wing ochreous white.

*Hab.* TRANSVAAL, White R. (Cooke), 1 ♂ type. *Exp.* 24 mm.

(75 a) *Pyrausta arenicola*, sp. n.

Head and thorax ochreous, the frons whitish ; palpi white at base ; pectus and legs white, the tibiæ and tarsi tinged with ochreous, the tarsi with brownish bands ; abdomen white tinged with ochreous. Fore wing ochreous tinged with fulvous ; a brownish antemedial line, somewhat oblique from costa to median nervure ; a faint dark discoidal lunule ; postmedial line brown, excurved from costa to vein 2, then bent inwards to near origin of vein 2, where there is a dark point, then again bent outwards and with a dark point above inner margin ; cilia whitish at tips. Hind wing pale ochreous tinged with fulvous towards termen ; cilia whitish at tips.

*Hab.* ALGERIA, Biskra (Walsingham), 3 ♂ type. *Exp.* 18 mm.

(92 a) *Pyrausta brachypteralis*, sp. n.

♂. Head and thorax rufous ; palpi below and throat white ; mid and hind tibiæ and tarsi white, the fore tibiæ white, with rufous band near extremity ; abdomen pale rufous. Fore wing pale rufous ; a slight dark discoidal lunule ; a postmedial series of fuscous points excurved between veins 6 and 4, then very oblique ; a fine terminal rufous line ; cilia rufous at base, whitish at tips. Hind wing short and rounded, yellowish tinged with rufous, the termen and base of cilia deeper rufous from apex to vein 2.

*Hab.* PARAGUAY, Sapucay (Foster), 2 ♂ type. *Exp.* 26 mm.

(92 b) *Pyrausta sabulosa*, sp. n.

♂. Head, thorax, and abdomen ochreous tinged with rufous ; palpi white at base ; antennæ with long cilia, the shaft with dark rings. Fore wing ochreous tinged with rufous and irrorated with rather large brown scales ; a slight dark discoidal bar ; postmedial line indistinct, dark, excurved between veins 5 and 2, then bent inwards to near origin of vein 2 and again slightly excurved ; a series of black points just before termen ; cilia with a brown line near base. Hind wing pale ochreous slightly irrorated with brown ; an indistinct dark postmedial line excurved between veins 5 and 2, then bent inwards to below end of cell, and



oblique to inner margin; a terminal series of dark strise; the underside paler, a dark discoidal point, the postmedial line distinct, a terminal series of black points from apex to submedian fold.

*Hab.* MEXICO, Las Vigas (*Schaus*), 1 ♂ type. *Exp.* 26 mm.

(95 a) *Pyrausta costimacula*, sp. n.

♂. Head blackish, the palpi at base and sides of frons white; thorax rufous, the dorsum and dorsal edge of tegulae blackish; pectus and legs whitish tinged with rufous, the fore tibiae rufous, the tarsi black ringed with white; abdomen fuscous brown, the anal tuft rufous, the ventral surface whitish tinged with rufous. Fore wing rufous; a small black spot at base of costa; an antemedial black spot in cell and double points at vein 1 and above inner margin; a small black discoidal lunule; postmedial line blackish, with prominent black spot at costa, excurved to vein 4 towards termen, then oblique; cilia brown, white towards tornus. Hind wing whitish tinged with ochreous brown; slight blackish marks on termen at veins 7, 6.

*Hab.* N.E. PERU, Huancabamba, 1 ♂ type, El Porvenir, 1 ♂. *Exp.* 32 mm.

(97 a) *Pyrausta rubrifusa*, sp. n.

♀. Head and thorax ochreous suffused with red; palpi at base, pectus, legs, and abdomen ochreous. Fore wing ochreous suffused with blood-red; a faint dark antemedial line, oblique to vein 1; a blood-red spot in middle of cell and discoidal bar; postmedial line faint, dark, excurved to vein 2, then bent upwards to lower angle of cell and slightly excurved below submedian fold; a faint curved subterminal shade. Hind wing ochreous yellow, with a faint dark subterminal line.

*Hab.* JAMAICA (*Kaye*), 2 ♀ type. *Exp.* 28 mm.

(103 a) *Pyrausta gazalis*, sp. n.

♀. Pale straw-yellow; palpi black at tips; fore tibiae banded with black at extremities. Fore wing with the basal half of costal area suffused with fuscous; a strong, erect, straight antemedial line; a discoidal lunule conjoined to the dark costal area; postmedial line strong, straight from costa to vein 5, excurved to vein 2, then straight to inner margin; a fine black terminal line; cilia fuscous, with a black line

near base. Hind wing with fuscous discoidal point ; post-medial line strong, bent outwards between veins 5 and 2, then retracted to below angle of cell and oblique to inner margin near tornus ; a fine black terminal line ; cilia with a blackish line near base. the tips tinged with fuscous except towards tornus.

*Hab.* GAZALAND, Chirinda Forest (*Marshall*), 1 ♀ type. *Exp.* 30 mm.

(107 b) *Pyrausta phaeopastalis*, sp. n.

♀. Head yellow ; palpi rufous, white at base ; thorax pale yellow-brown ; pectus and legs whitish ; abdomen pale fuscous brown, with slight whitish segmental rings, the anal tuft yellow. Fore wing pale yellowish thickly suffused and irrorated with fuscous brown, leaving the costa towards apex and termen yellower ; a faint dark spot in end of cell and discoidal lunule ; traces of a dark diffused postmedial line, more distinct towards costa, oblique from costa to vein 4, then inwardly oblique ; a terminal series of slight dark striae ; cilia yellow. Hind wing greyish ochreous suffused with fuscous brown ; a slight dark terminal line ; cilia yellow ; the underside paler, with traces of a curved post-medial line.

*Hab.* BR. E. AFRICA, Nairobi (*Crawshay*), 1 ♀ type. *Exp.* 26 mm.

(126 a) *Pyrausta albogrisea*, sp. n.

♀. Head, thorax, and abdomen grey-white mixed with dark brown, the pectus, legs, and ventral surface of abdomen whiter. Fore wing dark brown irrorated with grey-white ; traces of a dark antemedial line defined on outer side by whitish ; a dark point in middle of cell and discoidal bar ; postmedial line very indistinct, dark, excurved from below costa to vein 3, then incurved and with yellowish spot at submedian fold ; a fine white line at base of cilia. Hind wing white slightly irrorated with brown ; a slight curved postmedial line ; a blackish terminal line, expanding into small spots at the veins ; cilia dark at tips ; the underside with small black discoidal lunule.

*Hab.* W. COLOMBIA, San Antonio (*Palmer*), 1 ♀ type. *Exp.* 24 mm.

(142 a) *Pyrausta sanguifusalis*, sp. n.

♂. Head, thorax, and abdomen deep ochreous yellow, the head and thorax suffused with blood-red ; sides of frons with

white streaks ; pectus, legs, and ventral surface of abdomen yellowish white. Fore wing ochreous yellow, the costal area broadly suffused with dull blood-red to beyond middle : broad, almost confluent, diffused, red basal antemedial and postmedial bands, the two latter confluent below the cell ; a broad terminal red band with diffused inner edge almost confluent with the postmedial band ; cilia yellow. Hind wing white tinged with yellow.

*Hab.* BR. E. AFRICA, Tana R. (*Crawshay*), 1 ♂ type. *Exp.* 16 mm.

(144 a) *Pyrausta hæmatidalis*, sp. n.

♂. Deep ochreous yellow ; head and thorax partly suffused with blood-red ; palpi fulvous, whitish below. Fore wing with the costal area deep blood-red to the postmedial line ; three subbasal red spots, almost forming a maculate band ; grey spots edged with blood-red at middle of cell and on discocellulars ; a V-shaped medial grey band edged with blood-red, the inner arm arising from a spot at middle of cell, the outer arm from beyond the discoidal spot, the two confluent below the cell and expanding in submedian fold, the postmedial line forming the outer edge of this band and continued to the costal fascia as an obsolescent red line slightly bent outwards below costa ; a subterminal grey band defined by waved red lines, its inner edge angled inwards below the costa and at discal and submedian folds ; a narrow red terminal band with points on its inner edge ; cilia yellowish white, with brown medial line. Hind wing with indistinct diffused brownish patches at lower angle of cell and on inner area ; a brown terminal band with diffused inner edge, leaving some yellow on termen ; cilia yellow, with brownish tips ; the underside with the costal area broadly suffused with brown to beyond middle and conjoined to the patch at lower angle of cell.

♀. Hind wing wholly suffused with fuscous brown, leaving the costal area yellowish to beyond middle.

*Hab.* BR. E. AFRICA, Machakos (*Crawshay*), 1 ♂ type, Stoney R. (*Crawshay*), 1 ♀. *Exp.* 16 mm.

(144 b) *Pyrausta hæmatidea*, sp. n.

♂. Head, thorax, and abdomen purplish red mixed with yellowish ; palpi white at base ; pectus and legs whitish, the fore tibiae banded white and brown ; abdomen with white patch on anal tuft above, the ventral surface white. Fore

wing purplish red suffused with leaden grey, the costa and termen yellow; a curved yellow antemedial band defined at sides by red; a blackish discoidal lunule; a yellow postmedial band defined at sides by red, incurved at discal fold, at vein 3 bent upwards to lower angle of cell, then again excurved; cilia yellow slightly tinged with red. Hind wing purplish red suffused with leaden grey, the costal area yellowish to beyond middle; a postmedial yellow band defined at sides by red, oblique to vein 2, where it is almost confluent with a terminal spot in submedian fold, then retracted to below angle of cell, and forming a wedge-shaped patch on inner area; cilia yellow slightly tinged with red.

*Hab.* GERM. E. AFRICA, Ruaha R. (*Neave*), 2 ♂ type. *Exp.* 14 mm.

(145 a) *Pyrausta flavidiscata*, sp. n.

*Syllythria panopealis*, Druce, Biol. Centr.-Am., Het. ii. p. 207 (part.), nec Wlk.

♂. Head and thorax yellow mixed with rufous; pectus and legs white tinged with ochreous; abdomen yellow tinged with brown and with some red near extremity, the ventral surface white. Fore wing yellow, the costal area rufous, the antemedial and postmedial areas suffused with brown, leaving a triangular yellow patch on medial area from subcostal nervure to vein 1, the terminal area tinged with rufous; antemedial line dark, bent outwards below costa, then oblique; a dark discoidal striga; postmedial line dark, oblique towards costa, then obliquely incurved, excurved between veins 5 and 3, then bent inwards to below end of cell, and erect to inner margin; an indistinct, diffused, sinuous subterminal shade. Hind wing yellow; an obliquely curved dark postmedial line from discal fold to tornus, with rufous suffusion before it; the apical area suffused with brown; the underside yellow, a blackish discoidal point, postmedial line blackish, excurved between discal fold and vein 2.

*Hab.* GUATEMALA, Zapote (*Champion*), 1 ♂ type; PANAMA, Chiriqui (*Champion*), 4 ♂, Godman-Salvin Coll. *Exp.* 14-16 mm.

(146 a) *Pyrausta flavibrunnea*, sp. n.

*Syllythria phœnicealis*, Druce, Biol. Centr.-Am., Het. ii. p. 208 (part.), nec Hübn.

Head, thorax, and abdomen yellow mixed with brown, the last with yellow segmental lines; palpi white below towards



base; pectus, legs, and ventral surface of abdomen white, the fore legs brown in front. Fore wing yellow tinged with rufous, especially on costal and terminal areas, irrorated and in parts suffused with brown; antemedial line brown, sinuous; a small dark spot in upper part of middle of cell and a discoidal lunule with some brown suffusion beyond it; postmedial line brown, defined on outer side by yellow forming patches below costa and towards inner margin, excurved and minutely dentate from vein 6 to 2, then bent inwards to below end of cell, and angled outwards at vein 1; an indistinct, minutely dentate, brownish subterminal line, with brownish suffusion beyond it; a terminal series of minute dark lunules; cilia with a series of brown points near base and brownish tips. Hind wing yellow tinged with brown except on costal area to the postmedial line, which is brown and oblique from just below costa to termen at submedian fold; the terminal area suffused with brown, narrowing to a point at submedian fold; the termen with a series of minute dark lunules and the cilia with a series of brown striæ near base from apex to vein 2; the underside with dark discoidal lunule, postmedial minutely waved line, excurved from vein 5 to 2, where it terminates, and subterminal shade from costa to vein 2.

*Hab.* MEXICO, Cuernavaca, Morelos (*H. H. Smith*), 2 ♀ type, Godman-Salvin Coll. *Exp.* 22 mm.

(150 a) *Pyrausta perfervidalis*, sp. n.

♀. Head, thorax, and abdomen fulvous yellow suffused with fiery red; palpi fuscous, white below; frons brown, with fine lateral white streaks; pectus, legs, and ventral surface of abdomen whitish. Fore wing fulvous irrorated with fiery red, the costal and terminal areas broadly suffused with fiery red-brown; a diffused curved red antemedial line; a diffused fiery-red discoidal patch with whitish point in centre; postmedial line slightly excurved between veins 5 and 2; a black terminal line; cilia blackish at base, white at tips. Hind wing fulvous red, the terminal area broadly red-brown; an oblique blackish discoidal bar, with oblique line from it to inner margin; an oblique postmedial line from costa to the terminal band at vein 2, slightly bent outwards at vein 5; a fine black terminal line; cilia blackish at base, white at tips.

*Hab.* BR. E. AFRICA, Nairobi plains (*Crawshay*), 1 ♀ type. *Exp.* 18 mm.

(150 b) *Pyrausta prostyialis*, sp. n.

♂. Head, thorax, and abdomen orange-yellow; palpi dark brown, white below towards base; frons with white streaks at sides; antennæ fuscous; throat white; pectus brown in front; ventral surface of abdomen pale yellow. Fore wing yellow tinged with fiery red, especially on terminal area, the costal area suffused with fuscous to the postmedial line; antemedial line dark, angled outwards in submedian fold; a dark discoidal lunule; postmedial line dark, sinuous to vein 2, then bent inwards and obsolescent to below end of cell, and again excurved; a black terminal line; cilia white, with a strong black line near base. Hind wing yellow slightly tinged with red; a blackish discoidal bar; postmedial line blackish, somewhat oblique to vein 2, then bent inwards and obsolescent to lower angle of cell and sinuous to inner margin; a black terminal line except towards tornus; cilia white, with a strong blackish line near base except towards tornus; the underside with the postmedial line incurved at discal fold.

*Hab.* TRANSVAAL, White R. (Cooke), 1 ♂ type. *Exp.* 14 mm.

(151 a) *Pyrausta metachrysalis*, sp. n.

♂. Head, thorax, and abdomen olive suffused with fuscous; palpi white at base; tarsi white; abdomen at sides and below yellowish. Fore wing olive suffused with pale rufous; an oblique antemedial series of indistinct rufous spots; a slight spot at middle of cell and faint discoidal lunule; a deep rufous rather diffused postmedial line, excurved from costa to vein 4, then incurved, defined on outer side by a yellow band. Hind wing deep orange. Underside of fore wing orange, with diffused red postmedial band from costa to vein 4 and diffused subterminal band; hind wing with diffused red subterminal line from costa to vein 2, the termen and cilia tinged with red.

*Hab.* CHILI, Chillan (*Elwes*), 2 ♂ type. *Exp.* 26 mm.

Subsp.—♂. Fore wing with the suffusion and markings rather darker.

♀. Fore wing suffused with deep chocolate-brown to the postmedial line.

*Hab.* PATAGONIA, Chubut, Valle Lago Blanco, 1 ♂, 5 ♀. *Exp.* 20 mm.

(165 a) *Pyrausta diatoma*, sp. n.

♂. Head, thorax, and abdomen fulvous yellow; palpi rufous, white below at base; pectus, legs, and ventral surface of abdomen white. Fore wing yellow; the costal area tinged with blood-red towards base; an oblique diffused blood-red line from costa beyond middle to middle of inner margin; the termen tinged with blood-red. Hind wing yellowish white; the underside with brownish postmedial shade from costa to vein 3.

*Hab.* NATAL, Estcourt (*Hutchinson*), 1 ♂ type. *Exp.* 18 mm.

(170 a) *Pyrausta rhodoxantha*, sp. n.

*Syllithria tyralis*, Druce, Biol. Centr.-Am., Het. ii. p. 206 (part.), nec Guen.

Head and thorax purplish pink mixed with yellowish; palpi white below; pectus and legs yellowish tinged with red-brown; abdomen yellowish dorsally suffused with purplish red. Fore wing purplish pink; some yellowish at base of inner margin; a yellowish subbasal spot in submedian interspace and an oblique antemedial band from middle of cell to inner margin; a quadrate discoidal spot with some diffused yellowish from it to inner margin; a yellowish postmedial band, excurved to vein 4, then bent inwards to near angle of cell, and erect to inner margin; some slight yellow marks before termen; a terminal brown line from apex to vein 4; cilia brownish white. Hind wing yellowish tinged with brown, the termen crimson from apex to vein 2, on which there is a crimson streak, a brown band before termen from apex to vein 4.

*Hab.* MEXICO, Guadalajara (*Schaus*), 1 ♂ type, Guerrero, Amula (*H. H. Smith*), 1 ♀, Cuernavaca, Morelos (*H. H. Smith*), 1 ♂, Yucatan, Temax (*Gaumer*), 1 ♂, Godman-Salvin Coll. *Exp.* 20 mm.

(173 a) *Pyrausta tenuilinea*, sp. n.

♂. Head brown; thorax brown suffused with purplish pink; pectus, legs, and abdomen whitish suffused with brown. Fore wing purplish pink; a curved yellowish antemedial line; a brown discoidal striga; postmedial line fine, yellowish, excurved and slightly sinuous to vein 4, then retracted to below end of cell and again excurved; a terminal series of minute dark points; cilia brown.

whitish suffused with brown; some purplish pink on terminal part of vein 2; a fine black terminal line; cilia whitish.

*Hab.* W. COLOMBIA, El Credo, 1 ♂ type. *Exp.* 14 mm.

(183 a) *Pyrausta rubescentalis*, sp. n.

Head and thorax yellowish suffused with dull red; palpi fulvous, white below; frons with lateral white streaks; abdomen ochreous dorsally suffused with fuscous; pectus, legs, and ventral surface of abdomen white. Fore wing dull crimson more or less strongly suffused and irrorated with fuscous; the costa towards apex, termen, and cilia bright yellow; a slightly curved yellow antemedial line; slight dark spots at middle of cell and on discocellulars; postmedial line yellow, excurved and slightly waved from costa to vein 3, then retracted to below end of cell and sinuous to inner margin. Hind wing yellowish more or less strongly suffused with fuscous, the termen reddish, the cilia yellow; traces of a curved yellowish postmedial line between veins 5 and 2; the underside with faint dark discoidal spot, the postmedial line traceable throughout, excurved between veins 5 and 2.

*Hab.* PARAGUAY, Sapucay (*Foster*), 1 ♂; ARGENTINA, Florenzia, Gran Chaco (*Wagner*), 2 ♂ type. *Exp.* 16 mm.

(183 d) *Pyrausta rhodope*, sp. n.

♂. Head and thorax yellow mixed with purplish red; palpi red, white at base, the third joint brown; pectus and legs white, the fore and mid tibiae and the tarsi banded with red; abdomen with the basal segments yellowish white, the terminal segments red with a dorsal silvery-white spot at base of anal segment, the ventral surface white. Fore wing yellow, the costal area suffused with purplish red, some purplish red on inner area near base; antemedial line purplish red, oblique to submedian fold, then incurved; an annulus in middle of cell and elliptical discoidal mark defined by purplish red; the outer part of medial area suffused with purplish red to the postmedial line, which is oblique to discal fold, then waved and incurved below vein 3, a curved band of red suffusion beyond it from costa to termen at discal fold; a terminal series of brown points; cilia purplish red. Hind wing white, the terminal area suffused with brown, broadly at costa, narrowing to tornus. Underside white, the fore wing with reddish suffusion on costal half of terminal area.



Ab. 1. Fore wing uniformly suffused with purple-red, the outer medial area somewhat darker.

♀. Abdomen without the silvery-white spot on anal segment; fore wing nearly uniform pale red; hind wing tinged with reddish except on basal area.

*Hab.* CUBA, Santiago (*Schaus*), 5 ♂, 3 ♀ type. *Exp.* 24 mm.

(193 b) *Pyrausta heliothidia*, sp. n.

♂. Head and thorax black-brown mixed with some ochreous; abdomen black-brown with slight ochreous segmental lines; pectus, legs, and ventral surface of abdomen yellow irrorated with black. Fore wing grey-brown thickly irrorated with black-brown. Hind wing yellow; a black fascia in lower part of cell, with some greyish hair on it from near base to just beyond the cell, and a similar fascia above inner margin from near base to tornus; a black subterminal band diffused on apical half to the black terminal line; cilia blackish mixed with yellow. Underside ochreous yellow; fore wing with black spot in middle of cell and discoidal bar.

*Hab.* PERU, Oroya, 1 ♂ type. *Exp.* 18 mm.

(211 a) *Pyrausta albescens*, sp. n.

♀. Head, thorax, and abdomen black-brown mixed with whitish, the pectus, legs, and ventral surface of abdomen with more white. Fore wing pale bronze-brown, the terminal area whitish, some blackish suffusion on basal inner area; a black streak below extremity of cell and spot at upper angle; some slight black streaks beyond lower angle of cell; a black terminal line. Hind wing whitish, the inner area suffused with brown; a blackish-brown postmedial band between veins 6 and 2 and a subterminal band; a black terminal line. Underside whitish suffused in parts with brown; fore wing with brown discoidal bar.

*Hab.* PERU, Oroya, 1 ♀ type. *Exp.* 18 mm.

(214 a) *Pyrausta holophæalis*, sp. n.

♀. Black-brown with a metallic gloss; frons with lateral yellow streaks; pectus and legs pale brown; fore tarsi yellowish; wings without trace of markings.

*Hab.* CHINA, Foo-chau (*Leech*), 1 ♀ type. *Exp.* 22 mm.

(214 b) *Pyrausta flavicollalis*, sp. n.

♀. Greyish fuscous; palpi at base, back of head, tegulae, pectus, legs, ventral surface, and extremity of abdomen bright yellow; fore tibiae and tarsi fuscous in front. Fore wing finely pencilled with black and bluish-white scales except costal and terminal areas.

*Hab.* ARGENTINA, Florenzia, Gran Chaco (*Wagner*), 1 ♀ type. *Exp.* 18 mm.

[To be continued.]

II.—*Notes on the Lamellicorn Genus Popillia and Descriptions of some new Oriental Species in the British Museum.*  
By GILBERT J. ARROW.

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IN Dr. Kraatz's list of the species of *Popillia* in the *Deutsche ent. Zeitschr.* 1892 (p. 303), lamentable confusion was introduced into the classification of this difficult genus. Dr. Kraatz's collection has happily become accessible, and the specimens of *Popillia* from India and China have been kindly sent to me for examination by Herr Schenkling. Hence the present notes. Having also examined the types of Hope and Newman in London and Oxford, and a number of Fairmaire's in the Paris Museum, I am able to at least partially correct the confusion which has resulted from the inadequate descriptions of all those writers. Not only has Kraatz misapplied the names given by all his predecessors mentioned, but he has burdened his catalogue with numerous names of colour-varieties, which in several cases are not varieties of the species to which he has assigned them. He has not avoided the repetition of the same name for these varieties (e. g., *cupricollis* occurs three times and *testaceipennis* twice), and so evidently did not contemplate their use as specific names in any case; and as they are merely descriptive of the colours of individual specimens, and are sometimes left to explain themselves without any attempt at definition, they are evidently not applicable as specific names. This is also the case with the many varietal names introduced by Ohaus, who has a var. *testaceipes* of *P. complanata*, Newm. (the new species *P. pulchripes* of the present paper),

and also a var. *testaceipes* of *P. deplanata*, Ohaus, both described in the course of the same work.

Having separated *Popillia 6-guttata*, Fairmaire, from the genus *Popillia*, and formed for it the new genus *Spilopopillia*, figuring the species upon his plate, Kraatz, upon a later page of his monograph, has described a very closely related insect with all the same generic features as a *Popillia* under the name of *6-maculata*. This is a broader form, with almost the same pattern, but nearly black ground-colour, and the pronotum is smooth, with fine and scanty puncturation. It should be called *Spilopopillia 6-maculata*.

I have long ago recorded my opinion that Kraatz's genus *Pœciliosticta* must be for the present merged in *Anomala*. The same applies to *Hadropopillia*, which is synonymous with the subgenus *Spilota*.

The four species placed together as *Ischnopopillia* are not naturally associated together. The description applies best to *rugicollis*, Newm., and *moorei*, Kr. (the female of the latter was redescribed by Kraatz as *andrewesi*), of which the former may be considered the type of the genus. *I. exarata* and *erythroptera* I consider species of *Anomala*.

*P. fimbriata*, Newm., does not belong to the genus. It will be described in the 'Fauna of British India.'

*P. gemma*, Newm., is not the species described by Kraatz under that name. It is the same as *P. metallicollis*, Fairm. Dr. Kraatz's species is named *P. pulchra* later in this paper.

*P. perotteti*, Kr., is *P. chlorion*, Newm., of which *P. cœrulea*, Boh., is not a variety. The form from Szechuen called *perotteti*, var. *chrysitis*, Kr., is a var. of *P. inconstans*, Fairm., and not of *perotteti*. *P. straminipennis*, Kr., is *4-guttata*, F., and *P. chinensis*, var. *sordida*, Kr., is a form of the same species and identical with *P. castanoptera*, Hope. The so-called varieties of *chinensis*, *purpurascens*, and *frivaldskyi* belong to yet another species distinguished by the smooth pronotum and the quadrate clypeus of the male, which sex was overlooked by Kraatz.

*P. andamanica*, Kr., has been pronounced by Ohaus to be only a variety of *P. marginicollis*, Hope, but it is a very distinct species, marked, amongst other features, by the absence of a mesosternal process.

*P. marginicollis*, Hope, is the type of a group of species all distinguished by a peculiar type of elytral striation, but differing greatly in the form of the sternal process and other features. As all those hitherto known have been confused with *P. marginicollis*, I have tabulated and named here those known to me. They differ from all other Oriental species in

having upon each elytron five dorsal striæ (that is, striæ lying between the suture and the humeral callus) equidistant from each other and without rows of punctures between them. The ventral segments are each divided at the sides into two pseudo-segments by a carina from which spring hairy fringes, and in most species another row of hairs arises from the anterior margin of each segment. This double fringe is not visible at the extreme outer edge of the abdomen, and is most apparent, when present, in the penultimate segment.

Most of the species are subject to very great variation in pigmentation, especially upon the elytra.

Mesosternum more or less produced.

Ventral segments with single rows of hair . . . . . *pulchra*, sp. n.

Ventral segments with double rows of hair.

Upper surface without dark markings . . . . . *felix*, sp. n.

Upper surface with dark markings.

Elytra lightly striated . . . . . *lævistriata*, sp. n.

Elytra deeply striated.

Mesosternal process rather long.

Body convex; pale thoracic margin

vague . . . . . *mongolica*, sp. n.

Body not very convex; pale thoracic

margin sharp.

Pygidial tufts elongate, small . . . . . *marginicollis*, Hope.

Pygidial tufts large and compact . . . . . *birmanica*, sp. n.

Mesosternal process short.

Legs red, base of the pronotum strongly

emarginate . . . . . *taiwana*, sp. n.

Legs dark, base of the pronotum

feebly emarginate . . . . . *lewisi*, sp. n.

Mesosternum truncated.

Short; pronotum finely punctured, ventral seg-

ments with double rows of hair . . . . . *andamanica*, Kr.

Elongate; pronotum strongly punctured, ven-

tral segments with single rows of hair . . . . . *formosana*, sp. n.

### *Popillia pulchra*, sp. n.

*Popillia gemma*, Kr. (nec Newm.).

Læte cupreo-aurea, capite (clypeo excepto), pygidio (apice excepto) corporeque subtus aneo-viridibus, pedibus aureis, tarsis posticis nigris; corpus rhomboidale, vix convexum, sat breve, clypeo brevi, antice fere recto, crebre punctato, fronte fortiter punctato; pronoti lateribus sat fortiter medio vix punctato, angulis bene marcat, anticis acutis, posticis paulo obtusis, lateribus vix arcuatis, medio obtuse angulatis; elytrorum dorso profunde 5-striato, striis punctatis, interstitiis convexis, inæqualibus, subsuturali basi sparse punctato; pygidio profunde sed laxè transverse strigoso, basi haud dense flavido-bifasciculato, pectore toto abdominisque



lateribus sat longe hirsutis; processu mesosternali modice elongato, compresso, haud acuto.

Brilliant golden-yellow, with crimson and greenish reflections, the head (except the clypeus), pygidium (except the posterior half), and lower surface dark metallic green, and the legs golden, with the hind tarsi black.

The body is rather short and rhomboidal in shape and not very convex. The clypeus is short, nearly straight in front and closely punctured, and the forehead is strongly and not very closely punctured. The pronotum is distinctly but not closely punctured at the sides, very lightly in the middle, and the angles are well marked, the front ones acute, the hind slightly obtuse, the sides scarcely rounded but angulated before the middle. The scutellum bears a few minute punctures. The elytra have each five deep punctured dorsal striae. The interstices are convex, but the second and fourth are a little depressed and the former bears a few large punctures anteriorly. The pygidium is rather coarsely transversely strigose and bears two patches of pale hairs at the base. The sternum is clothed with rather long decumbent hairs and each ventral segment has a row of similar hairs at the side. The mesosternal process is compressed, rounded at the extremity, and moderately long. All the tibiae and the hind tarsi are short and thick in both sexes.

♂. The front tibiae are very broad and the two teeth short.

Length 9.5–11 mm.; breadth 6–6.5 mm.

*Hab.* BURMA: Karen Hills (2700–3300 ft., Dec. 1888), *L. Fea*.

*Popillia felix*, sp. n. (Fig. 2.)

Læte igneo-metallica, elytris cupreo-rosaceis: ovalis, convexa, clypeo subtilissime rugoso, fronte sat fortiter et crebre punctato, pronoto vix perspicue punctato; angulis anticis acutis, posticis valde obtusis, lateribus medio angulatis, haud arcuatis; scutello minute punctato; elytris striis 5 dorsalibus profunde impressis, interstitiis lævibus, convexis, æqualibus; pygidio sat grosse transverse striolato, basi bifasciculato; processu mesosternali sat longo, haud crasso; metasterni lateribus albo-hirtis, segmentisque ventralibus transversim bisectis, biseriatim pilosis.

Golden-red above and beneath, with the elytra orange-red, the pygidium bearing two basal patches of whitish hairs, the sternum densely clothed (except in the middle) with similar hairs, and each ventral segment bearing two rows of transversely placed hairs at the sides. The body is oval, compact

and convex, and the upper surface very smooth and shining. The clypeus is shortly transverse, nearly straight in front and very finely rugose, and the forehead is rather closely and evenly punctured. The pronotum is very smooth and shining and scarcely visibly punctured, with the front angles acute, the hind angles very obtuse, and the sides angulate in the middle and not visibly curved. The scutellum is very minutely punctured, and each elytron bears five deep, equidistant, dorsal striæ. The striæ are finely punctured and the interstices smooth and convex. The pygidium is convex and rather coarsely transversely strigose. The mesosternal process is moderately long and slender, not flattened. The tibiæ are stout and the two teeth of the front tibia short and close together.

♂. The front tibiæ are very broad and the two teeth minute and sharp.

♀. The terminal tooth of the front tibia is blunt and spatulate and the hind tarsi are very short and thick.

Length 13–14 mm.; breadth 8 mm.

*Hab.* ASSAM.

A pair in the British Museum and one in the Oxford Museum (from the Miers Coll.) are labelled "India" alone, and one in the German Entom. Nat. Museum is said to have come from Assam.

### *Popillia lævistriata*, sp. n.

Flavo-ænea, capite postice, pronoti disco, scutelloque obscure viridibus: elongata, parum convexa, nitidissima; clypeo subtiliter ruguloso, fronte modice punctato; pronoto parce et minute punctato, postice lævi, lateribus medio angulatis, angulis omnibus distinctis, anticis acutissimis, basi medio profunde exciso; elytris striis 5 dorsalibus minute punctatis leviter impressis, intervallis fere planis; pygidio transversim ruguloso, basi maculis duabus grossis setosis ornato; abdominis segmentis lateraliter transversim bisectis et biseriatim setosis; mesosterno modice producto, fere acuto.

Reddish testaceous, suffused (except upon the elytra) with a metallic-green lustre, the head (except the clypeus), the pronotum and scutellum deep green, the former with rather broad but vaguely defined yellow margins. It is rather elongate and extremely smooth and shining. The clypeus is very minutely rugulose and the forehead rather closely punctured. The pronotum is very minutely punctured at the front and sides, the lateral margins are sharply angulated in the middle, the front angles very acute, the hind angles

slightly obtuse but not rounded, and the base strongly excised before the scutellum, which bears only a few minute punctures. Each elytron bears five equidistant punctured striae, which are lightly impressed, with the intervals scarcely convex. The pygidium is coarsely transversely rugose and bears two rather large compact patches of whitish hairs at the base. The ventral segments are divided laterally by median carinae, and each bears a double fringe of stiff hairs. The mesosternum is produced into a moderately long and acute process.

♂. The legs are very short and thick, and the front tibia bears two very minute sharp teeth placed close together at the extremity.

Length 11 mm.; breadth 6 mm.

*Hab.* ASSAM: Patkai Hills (*Doherty*).

I know only a single specimen (in the British Museum).

*Popillia mongolica*, sp. n. (Fig. 5.)

Testacea, capite toto, pronoto (lateribus vage flavis exceptis), scutello corporeque subtus obscure viridibus, corpore toto viridi-metallico-suffuso, elytris plus minusve fusco-lineatis: late ovata, convexa, supra nitida, clypeo subtiliter ruguloso, fronte cum vertice crebre punctatis; pronoto et scutello parce et minute punctulatis, illo postice medio laevigato, hoc apice acute angulato; elytris profunde striatis, striis dorsalibus 5 crebre et minute punctatis; pygidio grosse transverse strigato, basi maculis duabus grossis setosis ornato; abdominis segmentis lateraliter transversim bisectis et biseriatim setosis; mesosterno modice producto.

*P. mongolica* is the most stout and globose species of the group known to me. The prothorax is very convex and round, smooth and shining, with a generally broad but rather vaguely limited pale lateral border. As in *P. marginicollis* and *birmanica*, the elytral striae are usually more or less tinged with dark pigment, which may extend on to some of the intervals. The pygidium is decorated with two large tufts of white hair, and the abdominal segments are distinctly doubly fringed at the sides. The mesosternal process is of moderate length.

Length 11–12 mm.; breadth 7–7.5 mm.

*Hab.* CHINA: Hong Kong, Foh-kien.

*Popillia birmanica*, sp. n. (Fig. 3.)

Rufo-testacea, fronte, prothoracis medio, scutello corporeque subtus plus minusve viridi-æneis, pedibus pallidis, elytris plerumque fusco-lineatis, corpore toto, elytris exceptis, viridi-metallico-tincto;

sat elongato, parum convexo, clypeo subtiliter ruguloso, fronte crebre punctato, pronoto parce minute punctato, postice lævigato: scutello fere lævi, apice rotundato; elytris striis dorsalibus 5 profunde impressis, confluentur punctatis, interstitiis convexis; pygidio grosse transversim strigato, basi maculis duabus grossis setosis lineisque setarum lateralibus fere ad apicem ductis ornato; segmentis abdominalibus lateraliter transversim bisectis et biserialiter setosis; mesosterno modice producto.

Reddish testaceous, with the head (except the clypeus), the middle of the pronotum, the scutellum, and parts of the lower surface dark green, entirely suffused with a metallic-green lustre, except upon the elytra, which have usually more or less distinct longitudinal dark lines.

It is elongate in shape and not very convex. The clypeus is very minutely rugulose and the rest of the head distinctly punctured. The pronotum is very finely and sparingly punctured, with the middle of the basal part quite smooth. The scutellum bears a few very minute punctures and its apex is rounded. The elytra have each five very deep equidistant dorsal striæ bearing confluent punctures at the bottom, and the intervals are smooth and convex. The pygidium is coarsely transversely striolated and bears two large white hairy patches at the base and a line of irregular hairs on each side almost meeting at the apex. The ventral segments are divided by transverse carinæ at the sides and doubly fringed. The mesosternum is moderately produced.

Length 9-12.5 mm.; breadth 5-7 mm.

*Hab.* ASSAM: Sylhet, Patkai Mts., Cachar; BURMA: Momeit (*Doherty*); TENASSERIM: Papun (*Lt.-Col. Adamson*).

*Popillia taiwana*, sp. n. (Fig. 6.)

Rufo-castanea, capite (clypeo excepto), pronoti disco, scutello corporeque subtus fusco-viridibus, corpore toto (elytris exceptis) viridi-metallico suffuso; capite antice minutissime rugoso, postice fortiter punctato; pronoto convexo, antice et lateraliter laxo punctato, postice lævi, lateribus antrorsum a basi convergentibus, angulis distinctis, anticis acutissimis, baseos medio fortiter exciso, scutello minute punctato, apice rotundato; elytris striis 5 dorsalibus profunde impressis, minute punctatis; pygidio fortiter transversim punctato-striolato, basi maculis duabus grossis setosis ornato; abdominis segmentis lateraliter transversim bisectis, biserialiter setiferis; mesosterno paulo producto, haud acuto.

This is a compact convex species, with the posterior part of the head, the disc of the pronotum, and the scutellum very deep green, and the yellow margins of the pronotum con-



spicuous and sharply defined. It is only moderately shining above, the pronotum is finely punctured except behind, and the scutellum is broad and rounded, not angulate, at the apex. The mesosternum is produced into a short blunt process, and the sides of the abdominal segments bear double rows of short stiff hairs.

Length 10–11 mm.; breadth 6 mm.

*Hab.* Formosa (*Bowring*).

*Popillia lewisi*, sp. n.

Viridi-cuprea, elytris prothoracisque marginibus angustis, testaceis, lævissime metallescens, tarsis antennisque piceis: modice elongata, parum convexa, nitidissima, capite subtiliter dense rugoso, vertice polito, parce punctato, clypeo parvo, sutura obsoleta; pronoto a basi ad apicem angustato, antice et lateraliter sat fortiter punctato, postice medio levissimo, basi medio parum profunde exciso; scutello vix punctato: elytris striis 5 dorsalibus profunde impressis, his minute punctatis, stria sexta grosse punctata, antice abbreviata, reliquis grosse punctatis; pygidio grosse transversim rugato, utrinque macula 2-forma flavo-pilosa ad apicem fere conjuncta, ornato; processu mesosternali brevi, compresso, corpore subtus ad latera flavido-piloso, abdominis segmentis lateraliter transversim bisectis, biseriatim pilosis.

This is the third species of *Popillia* found in the Japanese Islands and the smallest and most distinct of the three, *P. japonica*, Newm., and *insularis*, Lewis, being nearly inter-related and having an additional dorsal stria. *P. lewisi* is easily distinguished from the rest of the *marginicollis* group by the form of the long, curved, pubescent patches upon the pygidium. In most of the species there are a few straggling hairs between the basal tufts and the apex of the pygidium, but here the hairs are almost equally dense from the base almost to the apex, forming a comma-like patch on each side. The sternal process is distinctly produced, but very broad and blunt, and the pronotum is rather long, with its sides convergent and only very feebly angulated in the middle.

Two male specimens have been found and presented to the British Museum by Mr. J. E. A. Lewis.

Length 9 mm.; breadth 5 mm.

*Hab.* Okinawa I. (Great Loo Choo).

*Popillia formosana*, sp. n. (Fig. 7.)

Æneo-castanea, capite, pronoto, scutello corporeque subtus obscure viridibus, elytris testaceis, haud metallicis, clypeo antico pronotique lateribus angustis plerumque testaceis, tarsis antennisque

rubris, femoribus tibiisque aut viridibus aut pallidis; sat brevis et convexa, clypeo minute rugoso, sutura recta, vertice irregulariter grosse punctato; pronoto brevi, convexo, subtiliter irregulariter punctato, lateribus medio fortiter angulatis; scutello paulo punctato; elytris striis 5 dorsalibus profundissime impressis et crebre punctatis, reliquis grosse punctatis, sexta antice abbreviata; pygidio fortiter transversim strigato, basi maculis 2 grossis setosis ornato; mesosterno antice verticali, recte angulato; corpore subtus ad latera sat longe griseo-piloso, abdominis segmentis lateraliter transversim bisectis, longe vix biserialiter pilosis.

This is a small species of rather elongate form, with the shoulders rather prominent, the dorsal striæ extremely deep and strong, and the intervals very convex. The pronotum is very distinctly punctured and deeply emarginate in front of the scutellum; the hairy patches on the pygidium are remote and not produced towards the apex, and the mesosternum is truncate squarely in front and not produced. The hairy clothing of the lower surface is long and shaggy, but not thick.

Length 8 mm.; breadth 4.5 mm.

*Hab.* FORMOSA: Tai-nan.

In my paper on the Ruteline Coleoptera of Ceylon (Ann. & Mag. Nat. Hist. (8) viii. 1911, p. 354), I pointed out that, contrary to the opinion previously held, only a small proportion of the Ceylonese Rutelinæ occurred also on the Indian mainland; but amongst this small number of species common to both I included the only species of *Popillia* found in Ceylon, following Kraatz and Ohaus, both of whom had made special studies of this insect and its varieties. Later investigation has shown that this species is no exception, but that the Indian forms determined by those authors as belonging to it are really distinct. The Ceylon insect must be called *P. discalis*, Walk., that being the oldest of the names bestowed upon it, for *complanata*, Newm., the name by which it has been known, belongs to a mainland form (the type is a female) superficially like it, but structurally different.

Identical colour-phases recur through a series of different species in this group, so that description of the colours alone, as has been thought sufficient hitherto, is quite valueless. Specimens from Southern India submitted to Dr. Kraatz by Mr. H. E. Andrewes and to Dr. Ohaus by myself have been determined by them as belonging to the numerous colour-phases of the so-called *P. complanata*, showing that

the varietal names were applied not to definite natural forms, but to similarly coloured phases of various species collectively.

It is essential that descriptions should include the distinctive male characters, the females of various species of this group, which is distinguished by the border of white hairs on each side of the pronotum, being extremely similar, while the males fall into two divisions. In that to which the Ceylonese *P. discalis*, with *lucida*, *chlorion*, *adamas*, &c., belong, the longer middle claw is entire, while in *P. complanata* and other species it is cleft.

Five species of the group hitherto unrecognized are here described. Like all its other known members, they are Indian, and will be tabulated in my volume in the 'Fauna of British India.'

*Popillia propinqua*, sp. n. (Fig. 15.)

Cuprea vel fusco-ænea, supra nitidissima, elytris testaceis: breviter ovata, clypeo et fronte dense rugosis, pronoto antice et lateraliter lævissime punctato, lateribus sat dense albo-setosis; scutello fere lævi; singulis elytris dorsaliter transverse impressis et 5-striatis, striis punctatis, interstitio subsuturali lato, antice fortiter lineato-punctato; pygidio grosse punctato, maculis magnis 2 albo-pilosis basi ornato; mesosterno compresso, curvato, acuto.

Deep metallic green or coppery above and beneath, with the elytra alone testaceous; shortly ovate and very shining above. The clypeus and forehead are densely rugose and the vertex strongly punctured. The pronotum is very shining, minutely punctured at the front and sides, with a close fringe of white setæ on each side. The scutellum is almost smooth. The elytra have each a distinct transverse impression before the middle and five punctured dorsal striæ, the subsutural interval being broad and bearing a row of strong punctures anteriorly. The pygidium is coarsely punctured and has two large, round, setose patches at the base and numerous scattered setæ towards the apex. The mesosternal process is strongly curved and sharp-pointed.

♂. The inner front claw is broad, but scarcely angulated, and the outer claw of the middle tarsus is entire.

Length 8.5–10 mm.; breadth 5–6.5 mm.

Hab. S. INDIA: Travancore (*G. S. Imray*).

This has the closest resemblance to *P. discalis* and *complanata*, but, with the exception of the elytra, it is uniformly dark in colour, the legs, clypeus, and sides of the pronotum being apparently always without the pale colouring which usually tinges them in the other two species. The foveæ

before the middle of the elytra are deeper and the mesosternal process is more pointed. The male is immediately distinguishable from that of *P. complanata* by the fact that the outer claw of the middle tarsus is not cleft. The ædeagus of the male *P. propinqua* is represented at fig. 15, and that of *P. complanata* at fig. 12.

*Popillia pulchripes*, sp. n. (Fig. 10.)

*P. complanata*, var. *viridipennis*, Kr. Deutsche ent. Zeitschr. 1892, p. 263.

*P. complanata*, var. *testaceipes*, Oh. Stett. ent. Zeit. 1897, p. 345.

Metallico-viridis, cyanea vel cuprea, prothoracis lateribus (anguste) pedibusque pallide flavis, sed tibiæ posticarum apice et tarsis posticis nigris: elongato-ovalis, convexa, nitida, prothoracis lateribus parce albido-setosis, pygidio maculis duabus haud magnis sed compactis basi ornato; clypeo rugoso, fronte crebre punctato; pronoto parce et minute punctato; scutello fere impunctato; singulis elytris fovea post scutellum striisque 5 dorsalibus punctatis profunde impressis, intervallo subsuturali modice lato, antice paulo punctato; pygidio grosse transverse striolato; processu mesosternali compresso, curvato, subacuto.

Uniform metallic green, blue or coppery above and beneath, with the extreme lateral edge of the prothorax and the legs bright orange, except the hind tarsi and the extremity of the hind tibiæ, which are almost black. The extremity of the abdomen is often orange also.

Rather elongate-oval in shape, very smooth and shining, with a scanty fringe of greyish hairs at the sides of the pronotum, a small but compact tuft on each side of the base of the pygidium, and a thin clothing at the sides of the body beneath. The clypeus is rugosely, and the forehead closely, punctured, the pronotum very finely and scantily (except near the sides) and the scutellum almost smooth. The elytra have each a deep transverse impression behind the scutellum and five strongly impressed and punctured striæ, and the intervals are convex, the second not much wider than the third and bearing only a few punctures. The pygidium is coarsely transversely punctured, and the mesosternal process is compressed, strongly curved, and not very blunt.

♂. The front tibia is armed with two short sharp teeth, the lower lobe of the inner front claw is not angulated, and the longer claw of the middle foot is not cleft.

Length 10–12 mm.; breadth 6–7 mm.

*Hab.* S. INDIA: Nilgiri Hills.



Taken in some numbers by Mr. H. L. Andrewes and Sir G. Hampson.

I have explained in my preliminary remarks why the names applied as varietal names to this and other forms described here cannot be retained.

*Popillia eximia*, sp. n. (Fig. 14.)

Supra omnino late viridis: subtus cuprea, ovalis, sat convexa, nitida, clypeo rugoso, fronte crebre punctato, pronoto antice et lateraliter minute punctato, postice lævi, lateribus setis albidis sat angusto marginatis, scutello lato, lævi, haud angulato; singulis elytris fovea profunda pone scutellum striisque 5 dorsalibus profundis punctatis impressis, intervallo subsuturali haud lato, impunctato; pygidio grosse transverse punctato, basi utrinque macula haud magna albo-setosa ornato; processu mesosternali modice longo, curvato, compresso.

Bright green above and coppery beneath, with a close but narrow margin of white setæ on each side of the pronotum and a small compact patch on each side of the pygidium.

It is oval and moderately convex in shape and very smooth and shining above. The clypeus is rugose, the forehead densely punctured, the pronotum finely and scantily punctured at the front and sides, and the scutellum almost unpunctured. The last is broad and rounded at the apex. The elytra have each a very large and deep impression behind the scutellum and five deep dorsal striæ, which are distinctly punctured. The subsutural interval is scarcely wider than the next and almost unpunctured. The pygidium is coarsely transversely punctured, and the mesosternal process is moderately long, compressed, curved, and pointed.

♂. The two teeth of the front tibia are minute and sharp, the lower lobe of the inner front claw is not angulated nor very wide, and the longer claw of the middle feet is simple.

Length 11.5 mm.; breadth 7 mm.

*Hab.* S. INDIA: Nilgiri Hills (*G. F. Hampson*).

A single ♂ specimen.

*Popillia clara*, sp. n.

Viridis vel igneo-rufa, pronoti margine parvissimo griseo-hirto pygidioque utrinque fasciculo minuto ornato: ovalis, glabra, nitida, clypeo rugoso, fronte crebre punctato, prothorace lateraliter parce punctato; scutello lævi; elytris sat vage punctato-striatis; pygidio grosse strigato; processu mesosternali compresso, obtuso, fere recto.

Bright metallic green or fiery red above and beneath, or

with the upper surface, or the elytra only, fiery red; very smooth and shining.

The body is compactly ovate and moderately convex. The clypeus is rugose, short, with its front edge almost straight, and the forehead is closely punctured. The pronotum is very smooth and shining, with a few fine punctures near the front and sides, and the lateral grooves are deep and contain a very few inconspicuous whitish hairs. The scutellum is almost unpunctured and scarcely angulated at the apex. The elytra have each a distinct transverse impression before the middle and five lightly impressed and punctured dorsal striæ, the first, third, and fifth intervals being slightly convex, and the second broad and irregularly punctured along the middle. The pygidium is transversely strigose and bears a very minute tuft of outstanding whitish hairs on each side of the base and some scattered hairs towards the apex. The mesosternal process is moderately long, compressed, blunt, and nearly straight. The sides of the sternum and abdomen are clothed with long but not close hair.

♂. The front tibia is very broad and armed with two short but sharp teeth, the lower lobe of the inner front claw is angulated near the base, and the outer middle claw is cleft at the tip. The pygidium is smoother, shorter, and more inclined than in the female, and slightly protuberant at the extremity.

♀. The terminal tooth of the front tibia is long, curved, and blunt.

Length 9-12 mm.; breadth 5.5-7 mm.

Hab. S. INDIA: Nilgiri Hills (*H. L. Andrewes*), Pondichery.

Mr. Andrewes took this species in considerable numbers.

*Popillia schizonycha*, sp. n. (Fig. 11.)

Haud late viridis, viridi-aurea vel cuprea, elytris sæpe magis obscure viridibus, nigro-cyaneis vel rufescentibus, marginibus plus minusve infuscatis, clypeo, pedibus, abdominisque apice plerumque obscure rufis: corpus sat latum, robustum, supra nitidum; clypeo rugose punctato, fronte crebre punctato, scutello pronotoque antice et lateraliter minute et parce punctato, horum lateribus setis albidis modice late marginatis; singulis elytris fovea transversa post scutellum striisque 5 dorsalibus punctatis profunde impressis; pygidio grosse transversim striolato, basi maculis duabus setosis magnis rotundatis ornato; processu mesosternali longo, compresso, obtuso.

Deep green, golden-green, or coppery, with the elytra generally darker green or blue-black, but sometimes reddish

with a metallic-green suffusion and the sides more or less dark. The clypeus, legs, and extremity of the abdomen are sometimes also of a deep red colour.

It is a broad and massive insect, smooth and shining, and moderately convex above. The sides of the pronotum are conspicuously bordered with white hairs, the pygidium bears a pair of large round hair-patches at the base, and the lower surface is rather thickly clothed at the sides with similar white hairs. The clypeus is rugosely punctured, the forehead densely, and the scutellum and front and sides of the pronotum very finely and sparsely. The elytra have each a deep fovea behind the scutellum and five deeply impressed and punctured dorsal striæ. The subsutural interval is broad and has an irregular line of large punctures along the middle. The pygidium is coarsely transversely striolated, and the mesosternal process is strongly compressed and rounded at the extremity.

♂. The two teeth of the front tibia are short and sharp, the inner front claw has a broad angulated lower lobe, and the outer middle claw is cleft at the tip.

Length 11–12·5 mm.; breadth 6·5–7·5 mm.

*Hab.* S. INDIA: Bangalore, Nilgiri Hills (*H. L. Andrews*).

Three other Oriental species of *Popillia*, which have been described in connection with a volume in preparation for the 'Fauna of British India' series, may be conveniently included here:—

*Popillia pilosa*, sp. n.

Golden or coppery green, with the lower surface and legs darker coppery green, and the elytra testaceous, with a metallic sheen, and with the outer edges coppery black. The body is ovate and a little depressed. The clypeus is rugose and short, with the front margin feebly rounded and slightly reflexed. The forehead is rugosely punctured and clothed with long, erect, yellow hairs, and the vertex strongly and distinctly punctured. The pronotum is coarsely punctured, the punctures becoming confluent near the sides, and is also clothed with long but not close yellow hairs. The lateral margins are scarcely curved, angulated before the middle, with the front and hind angles sharp, the former produced, the latter right angles. The scutellum bears a few unequal punctures, and each elytron bears seven nearly equidistant dorsal punctured striæ, the second and fifth less impressed than the rest and abbreviated behind. There is no abrupt

lateral flange. The pygidium is punctured and bears two basal tufts of yellow hairs. The lower surface is clothed, except along the middle line of the abdomen, with long yellowish hair, and the mesosternal process is short and vertical in front.

♂. The inner front claw has the lower lobe very broad and angulate near the base, the two teeth of the front tibia are short and sharp, and the hind tarsi are rather longer and slenderer than those of the female.

Length 7.5–8.5 mm.; breadth 4.5 mm.

*Hab.* WESTERN HIMALAYAS: Dehra Dun; Kumaon; Lansdown Garhwal (*A. G. Lyell*, June 1909).

*Popillia simlana*, sp. n.

Golden or coppery green, with the legs and lower surface dark coppery and the elytra testaceous, with a metallic suffusion and the extreme lateral margins coppery black. The body is ovate and a little depressed. The clypeus is confluent punctured, broad, with the front margin nearly straight and strongly reflexed. The forehead is rugosely punctured and thinly clothed with erect yellow hairs. The pronotum is very strongly punctured, the punctures becoming confluent near the lateral margins, which are scarcely curved, angulated near the middle, with the front angles acute and the hind angles obtuse. The whole surface is thinly clothed with erect yellowish hairs. The scutellum bears only a few fine punctures and the elytra have each five complete punctured dorsal striæ, the second interval very wide and bearing many large irregular punctures, and the fourth having a few punctures forming an imperfect row along the middle. The pygidium bears coarse and not close transverse striolæ, and is decorated at the base with two tufts of greyish hairs. The lower surface and legs are similarly clothed with long, but not close, grey hairs, except at the middle of the abdomen. The mesosternal process is vertical in front and not produced beyond the front coxæ.

♂. The inner front claw has the lower lobe very broad, the front tibia is armed with two short and sharp teeth, and the hind tarsi are rather longer and slenderer than in the female.

Length 8–9 mm.; breadth 4–5 mm.

*Hab.* PUNJAB: Simla (7000 feet—*H. Chippendale*, June 1909); NEPAL: Khatmandu (*Col. Manners Smith*, June 1909).

This species exactly resembles *P. pilosa*, but is easily



distinguished by the broad reflexed clypeus. The elytral sculpture is also slightly different.

*Popillia amabilis*, sp. n.

Viridi-aurea vel cuprea, elytris, pedibus 4 anterioribus femoribusque posticis flavis, æneo-tinctis, tarsis posticis obscuris: elongato-ovalis, haud convexa, clypeo parvo, rugoso, fronte pronotoque crebre et grosse punctatis, horum basi lævigato, lateribusque rugatis; scutello parum punctato, elytris lineis 7 dorsalibus fortiter punctatis, lateribus abrupte deplanatis; pygidio maculis 2 magnis flavo-setosis fere conjunctis ornato; processu mesosternali valido, compresso, apice rotundato.

Rich golden-green, the elytra, front and middle legs and hind femora pale yellow with a metallic-green lustre, the lower surface, pygidium, and hind tibiæ generally reddish golden, and the hind tarsi dark brown.

It is elongate in shape and not very convex above. The pygidium bears two large patches of yellow setæ extending almost across it at the base, but scarcely meeting in the middle, the apex bears similar scattered setæ, and the lower surface is rather closely clothed at the sides. The clypeus is very short and rugose, the forehead strongly and densely punctured, and the pronotum coarsely and densely punctured except before the scutellum, the punctures coalescing near the sides. The scutellum bears only a very few punctures, and the elytra have seven dorsal rows of strongly impressed and punctured lines, the second line rather irregular and disrupted at the base. The sutural space is broad and tapers considerably at each end. There is a narrow but abrupt lateral flange at the external margin. The pygidium is scantily punctured and shining along the middle. The mesosternal process is strong, compressed, broad, and bluntly rounded at the end.

♂. The legs are stout, the front tibia armed with two short sharp teeth near the end, the lower lobe of the inner front claw is angulated near the base and the longer claw of the middle foot entire.

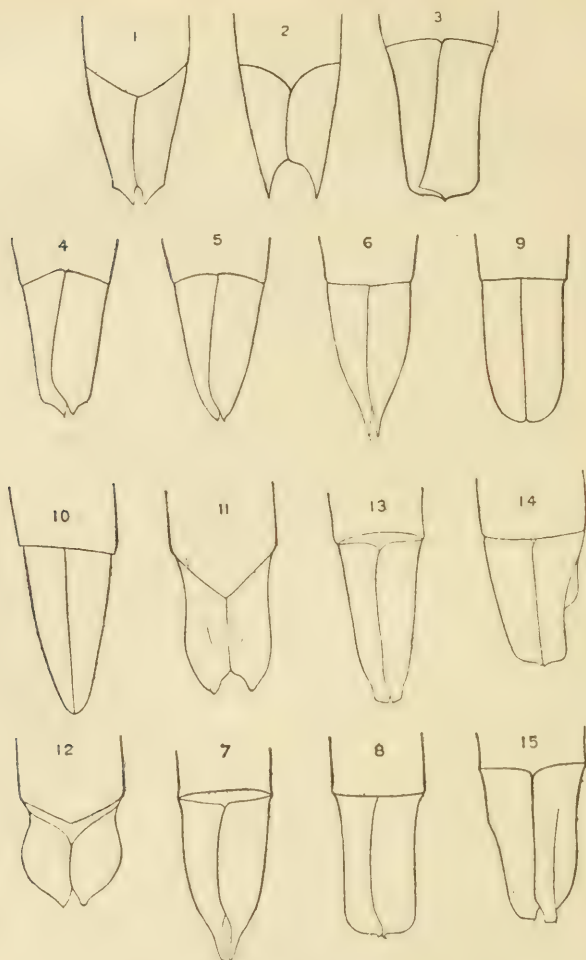
I do not know the female.

Length 9-10 mm. ; breadth 5-6 mm.

*Hab.* ASSAM: Manipur, Naga Hills (*Doherty*).

This species is very close to *P. difficilis*, Newm., but in that the pronotum is much less strongly punctured and the lateral flanges to the elytra are absent.

The types of all the species here described as new are in the British Museum.



The following is the explanation of the accompanying diagrammatic figures of the aedeagus of the male of species referred to in this paper:—

- Fig. 1. *Popillia marginicollis*.  
 Fig. 2.     " *felix*.  
 Fig. 3.     " *birmanica*.  
 Fig. 4.     " *andamanica*.  
 Fig. 5.     " *mongolica*.  
 Fig. 6.     " *taiwana*.  
 Fig. 7.     " *formosana*.  
 Fig. 8.     " *adamas*.

- Fig. 9. *Popillia lucida*.  
 Fig. 10.     " *pulchripes*.  
 Fig. 11.     " *schizonycha*.  
 Fig. 12.     " *complanata*.  
 Fig. 13.     " *discalis*.  
 Fig. 14.     " *eximia*.  
 Fig. 15.     " *propinqua*.

III.—Some *Mycetophilid* Synonymy (*Diptera*).

By F. W. EDWARDS.

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THE synonymy given in the following notes has been determined during a recent examination of the exotic MYCETOPHILIDÆ in the British Museum, particularly the species described from the Seychelles Islands by Enderlein (Trans. Linn. Soc., Zool. ser. 2, vol. 14, 1910, pp. 59–81).

Of Enderlein's species referred to, *Scottella argenteosquamosa* is the species previously described by Meijere from Java as *Allactoneura cincta*. As Brunetti has pointed out (Fauna Brit. Ind., Nematocera, p. 88, 1912), de Meijere, in his figure and description, has accidentally omitted any reference to the small cross-vein which probably represents the vein  $R_{2+3}$ , the presence of which indicates, as Johannsen has suggested, that this genus belongs to the *Sciophilinae*. The British Museum possesses undoubted specimens of *A. cincta* from Ceylon, and these differ in no way from the Seychelles specimens. The genus *Allactoneura* is a remarkably isolated one; it will include, besides the type species, *Scottella formosana*, End. (Trans. Linn. Soc. vol. xiv. p. 63, 1910), and *Mycetophila obscurata*, Walk. (Proc. Linn. Soc. vol. viii. p. 130, 1865). The former is distinguishable by the yellow base to the hind femora; the latter has black femora, but has the costal border instead of the apex of the wing darkened. Two specimens in the British Museum from Queensland have wings resembling *A. obscurata*, but have the base of the hind femora yellow; they may be *A. formosana*, the wings of which Enderlein does not describe.

*Aphanizophleps*, End., would seem to be indistinguishable from *Manota*, Will.

*Phronia flabellipennis*, End., *P. silhouettensis*, End., *P. areolata*, End., and *P. subvenosa*, End., are in reality all species of *Exechia*. The very different structure of the ovipositor shows that *P. subvenosa*, var. *tricincta*, is a distinct species; it also belongs to *Exechia*. *Macrobrachius breviparcatus*, though having the cubital fork rather shorter than usual, is a distinct *Phronia*.

*Mycetophila seychellensis*, End., *collaris*, End., and *luridiceps*, End., all belong to the genus *Delopsis*, Skuse. This transference renders invalid Brunetti's *Delopsis collaris* (Fauna Brit. Ind. p. 119, 1912), and I propose to rename this species *DELOPSIS BRUNETTI*, nom. nov. *D. brunettii*

differs from the other four described species in having a yellow scutellum. It may be mentioned that in none of the species (including *D. flavipennis*, Skuse, a specimen of which I have examined) does the anal vein quite reach the hind margin. In an undescribed species in the British Museum from Ashanti, the costa extends slightly beyond the tip of the radial sector.

The following Walkerian types in the British Museum are assignable to different genera from those in which they were originally described :—

<i>Platyura insolita</i>	belongs to	<i>Symmerus</i> (but $Sc_1$ is rather long, ending free).
<i>Leia unicolor</i>	"	<i>Mycomyia</i> (s. str.).
" <i>indivisa</i>	"	<i>Mycomyia</i> ( <i>Neoempheria</i> ).
" <i>nubilipennis</i>	"	<i>Acrodicrania</i> (but $Cu_1$ is not detached at base).
<i>Mycetophila apicalis</i>	"	<i>Boletina</i> (= <i>B. longicauda</i> , Lundstr., 1912).
" <i>cincticornis</i>	"	<i>Boletina</i> (= <i>B. nigricoxa</i> , Staeg., Lundstr.; hypopygium identical, but has yellow coxæ).
" <i>concolor</i>	"	<i>Boletina</i> (= <i>B. sciarina</i> , Mg.).
" <i>despecta</i>	"	<i>Phronia</i> .
" <i>plebeia</i>	"	<i>Exechia</i> .
" <i>bifasciata</i>	"	<i>Dynatosoma</i> .

#### IV.—Some new Species of Indian Tenebrionidæ.

By K. G. BLAIR.

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##### *Blaps armata*.

Elongata, prothorace leviter transverso, lateribus regulariter arcuatis, marginibus reflexis, dorso convexiusculo subtiliter punctulato; elytris elongato-ovatis, apice sat acute rotundato haud caudato; femoribus anticis ante apicem acute dentatis.

Long. 30 mm.

*Hab.* Chitral (*R. Hill*); Fort Sandeman (*E. P. Stebbing*).

This species, of which only the female is before me, seems to be very distinct from any other described species. From *B. femoralis*, Fisch., which has the anterior femora toothed, it differs, *inter alia*, in being only half as long and in inhabiting a different region; it cannot be placed in *Asidoblaps*



or *Carloenemodes*, but its general facies suggests a close relationship with *Blaps indicola*, Bates, though, without some knowledge of the male characters, it is impossible to speak with certainty. The evenly rounded and narrowly recurved margins of the thorax, the elongate-ovate form of the elytra, with the sides evenly rounded from base almost to apex (which, though acute, is not at all caudate), give the insect a very distinctive appearance. The lateral carina of the elytra is completely marginal.

*Setenis semiopaca.*

Nigra aut picea, subopaca, sutura clypeali subobsoleta, prothorace post apicem latiori, angulis anticis rotundatis, posticis acutis fere rectis, dorso sat regulariter punctato, foveis et linea media obsoletis; elytris postice ampliatis sat subtiliter punctato-striatis, intervallis planis, parte dorsali subnitida, postice et ad lateres per granulos minutos opacis; tibiis anticis et mediis maris leviter arcuatis, feminae rectis.

Long. 20-25 mm.

*Hab.* Sylhet (Brit. Mus.); Subatach, Jaunsaur, N.W. Himalaya (*Stebbing*).

This species must be very close to *S. parvicollis*, Fairm., though the thorax is but feebly transverse and has its greatest width shortly before the apex. The disc is convex, with a fairly dense and even puncturation and but faint traces of a median furrow and lateral foveæ. The elytral striæ are very slightly impressed and finely punctate, the interstices flat. The dorsal area is moderately shining, but the sides and posterior declivity are rendered opaque by the presence of minute granules. The femora are unarmed, the anterior and middle tibiæ of the male slightly curved, the apex clothed within with a short golden pubescence.

*Setenis semivalga.*

Oblonga, nigra, seminitida, sutura clypeali distincta; antennis longiusculis, articulis omnibus elongatis; prothorace transverso, angulis anticis rotundatis, posticis acute rectis, dorso sat parce punctulato, medio sat distincte sulcato utrinque leviter foveolato; elytris punctato-striatis, intervallis convexis; tibiis anticis maris medio incrassatis, subdentatis, arcuatis, apice auro-pubescentibus, ceteris et feminae omnibus leviter sinuatis.

Long. 25-27 mm.

*Hab.* Ceylon (Bates Coll.); Kudrai, Central Prov. (*Stebbing*).

Resembles *S. valga*, Wied., but the thorax is less transverse, with the sides subparallel, the median furrow entire, and the surface rather scantily and not strongly punctate. The striæ of the elytra are rather coarsely punctured, with the interstices convex. The anterior tibiæ in the male are thickened and subdentate in the middle; in *valga* the tooth is more pronounced and much nearer the femur; the distal portion is arcuate and clothed with a short golden pubescence at the apex. From *S. confusa*, Fairm., it is at once distinguished by the length of the antennæ, which reach almost to the base of the thorax, having all the joints longer than broad.

*Camarimena rugosistriata*.

Elongata, subparallela, fusco-ænea, nitida, corpore omnino sat parce supra inconspicue sericeo-pubescenti, capite prothoraceque dense sat fortiter punctatis, elytrorum striis dense rugoso-punctatis, intervallis parce et subtiliter punctulatis, sulculis transversis lateribus irregulariter rugatis; subtus pedibusque fusco-æneis, dense punctatis, femoribus anticis clavatis, ceteris vix incrassatis. Long. 18 mm.

*Hab.* "Ind. or." (Bates Coll.); Kumain, Jaunsaur, N.W. Himalaya (*Stebbing*).

Entirely bronze-coloured and covered with a scanty inconspicuous silky pubescence. The sculpture of the elytra is very distinct, the punctures of the striae being very closely placed and transversely elongate, giving off irregularly a short furrow which encroaches on the interstice, now on one side now on the other; the intervals are nitid and sparsely punctulate. The legs are densely punctured, with the femora but feebly clavate, those of the anterior legs being most strongly so.

This species had been separated by Bates from *Camari-mena* under the name of *Pigeus*, but without characterization of the genus. For the present, however, until the group comes to be revised, I consider it best to leave it in *Camari-mena*.

V.—On a new Species of *Clementia*.  
By A. J. JUKES-BROWNE, F.R.S., F.G.S.

[Plate I.]

THE shell which forms the subject of this communication is one of two specimens which were purchased by Mr. J. C. Melvill at the recent sale of Mr. Bülow's collection. They

were included in a small set of different species of *Caryatis* (= *Pitaria*), and were accompanied by a ticket bearing the inscription "*Caryatis aresta*, Dall and Simpson, Mayaguez, Porto Rico." Knowing that I was then making a study of the genus *Pitaria*, Mr. Melvill very kindly sent me one of these shells, together with some of the other species, for examination, which revealed the fact that the supposed "*Pitaria aresta*" did not belong to that species or genus, but were a form of *Clementia*.

So far as external appearance is concerned, the shell does closely resemble *P. aresta* as figured and described by Messrs. Dall and Simpson, and Porto Rico is the locality from which that species was obtained. Both are inflated shells of a dull white colour, with fine concentric striation, obliquely oblong in shape, with rather prominent umbones set far forward, so that there is a short anterior and a very long posterior slope. But the hinge of the shell hereafter described is very different from that of *Pitaria*, being without any lateral teeth, and having a deep triangular concavity in front of each anterior cardinal.

The special interest of this discovery lies in the fact that all the known recent species of *Clementia* are inhabitants of the Indian and Pacific Oceans, whereas this comes from the Caribbean Sea. There is no reason to doubt the accuracy of the label, which appears to be in the late Mr. Bülow's handwriting, nor is there any reason to suppose that this label had been interchanged with some other one, for none of the other species in the set resemble *P. aresta*, while these two shells might have been mistaken for that species by anyone who did not critically examine them inside.

I have compared the specimen in my hands with the figures and descriptions of all the known species of *Clementia*, and, further, by the kindness of Mr. J. J. MacAndrew I have had the opportunity of actually seeing specimens of most of the species, and I find the shell in question to be different from all of them. It is a stouter, stronger, and more chalky shell than any of the recent species, so that the interior has a smooth surface of its own, which is not the counterpart of the exterior, as in most recent species.

The only modern species to which it bears any resemblance is *Clementia vatheleti*, Mabile, from Korean waters. I am indebted to Mr. G. K. Gude for sending me a copy of Mabile's description of this species, which was not accompanied by a figure\*; from this Latin description *C. vatheleti*

\* Bull. Soc. Philom. Paris, (8) iii. p. 57 (1901).

seems to be similar in shape and equally oblique ("transverse oblongo-ovata"), but has several important points of difference, being regularly rounded in front and having a nearly straight postero-dorsal slope, while ventrally it is much deeper, so that the ventral border is nearly a complete semicircle; the shell is rather thin, so that the interior surface is undulating, to correspond with the exterior; the pallial sinus is wide and linguiform, passing beyond the middle of the shell ("medium longitudinis superante"). There seem also to be some differences in the position of the teeth.

The present species has also some resemblance to the figure of *Clementia grayi*, Dall, a fossil from the Upper Oligocene of Florida \*. This is an oblong shell, described as "convex, rude, concentrically coarsely and irregularly striated," so that the external appearance is similar, but it is less oblique and less elongate, and has a much deeper pallial sinus; moreover, Dr. Dall states that the cardinal teeth are entire, whereas in all the other species which I have examined the right posterior cardinal is deeply bifid.

Dr. Dall has also described the single right valve of a shell from the west coast of Mexico under the name of *Clementia solida*; but the dentition of this (as figured) † is very unlike that of any other species of *Clementia*, and if the shell does really belong to that genus, it will not compare with the form under consideration.

I have not been able to ascertain how the Porto Rico shells came into Mr. Bülow's possession, but there seems to be no doubt about their being a new species, and, as the obliquity of shape and the forward position of the umbones are such conspicuous features, I propose to give it the specific name of *obliqua*. The following is a description both in English and Latin:—

*Clementia obliqua*, J.-Br.

Shell rather larger ( $59 \times 44.5$  mm.), fairly strong, not thin, oblong-oblique, the umbones being so far forward that a vertical from them cuts off four-fifths of the length; anterior side attenuated, owing to the upward slope of the ventral margin (as in *Pitaria obliquata*); postero-dorsal slope long and arcuate, posterior side broadly rounded and subtruncate.

Valves inflated, dull white, coarsely and irregularly concentrically striated, not undulated, though some of the

\* Trans. Wagner Free. Inst. Sc. Philad. vol. iii. pl. xxxvii. fig. 12 (1900).

† Proc. U.S. Nat. Mus. vol. xxvi. pl. xiv. fig. 4.



striae are more prominent than others. Lunule cordate, faintly circumscribed and nearly flat, but not impressed; escutcheon not defined, but its ligamental edges slightly raised; ligament completely sunk, but conspicuous and rather long.

Interior smooth, white, opaque; pallial sinus ascending, angular, bounded by straight lines, not reaching to the middle of the valve. Posterior adductor scar larger than the anterior. Hinge-plate well developed and prolonged at each end, with three cardinal teeth in each valve, the first in the right being tall and prominent and the third deeply and widely bifid; in the left the first and second are united at the top, the third is distant, long, laminar, and highest at its posterior end.

Testa paulo major ( $59 \times 44$  mm.), satis valida, haud tenui, oblonga, obliquissima, umbonibus adeo proVectis ut linea de vertice pendens quatuor partes longitudinis a quinta desecat; latere antico attenuato, propter marginis ventralis acclivitatem; latere postico lato et subtruncato, declivitate dorsali arcuata.

Valvis inflatis, albidis, striis concentricis densis irregularibus sculptis, non undulatis, quanquam striae complures inter ceteras exstant. Lunula cordata, linea indistincta circumscripta, fere plana sed non impressa; area non definita, sed marginibus ligamentum contingentibus elevatis; ligamento elongato, profundato, sed per rimam conspicuo.

Pagina interna albida, opaca; sinu pallii ascendente, lineis rectis cincto, apice acuto, medio valvae non porrigente. Vestigio musculi posterioris quam anterioris majore. Lamina cardinali exserta et utrimque producta, dentibus tribus cardinalibus munita, quorum in valva dextra primus altus et prominens est, tertius late et profunde bifidus; in valva sinistra dentibus primo et secundo ad verticibus conjunctis, tertio longo, remoto, angusto, ad finem posticam altiori.

Since the above was written, I have ascertained from Dr. L. Germain that *C. vatheleti* has not yet been figured, and he has been good enough to send me one of the types in the Museum d'Histoire Naturelle of Paris, in order that it may be figured and compared with *C. obliqua*. I therefore take this opportunity of describing *C. vatheleti* in English.

Shell rather large ( $66 \times 56$  mm.), fairly strong, but not quite so solid as *C. obliqua*, oblong-ovate, and almost subquadrate, very oblique, with prominent umbones, which are placed very far forward; anterior side short and rounded, ventral side expanded into a semicircular curve and sloping up to meet the postero-dorsal border, so that the greatest length of the shell is across the muscular scars; postero-

dorsal margin slightly curved, but slope of the shell above nearly straight.

Valves inflated, irregularly undulated, and finely striated, the undulations being more regular and pronounced on the umbonal areas. Lunule flattish, not defined; escutcheon depressed and bordered by obscure ridges, which become angular near the umbones. Ligament short, broad, and conspicuous.

Interior surface undulating, white; pallial sinus wide, ascending, angular, reaching a little beyond the middle of the shell; adductor scars superficial and not differing much in size. Hinge-plate very short; teeth small and near together, both posteriors long and thin, that of the right valve being very narrow and not bifid, though it is grooved.

#### EXPLANATION OF PLATE I.

Figs. 1, 2. *Clementia obliqua*, J.-Br., right valve.

Figs. 3, 4. *Clementia vatheleti*, right valve.

VI.—*Descriptions of new Species of African Heterocera in the Oxford Museum.* By G. T. BETHUNE-BAKER, F.L.S., F.Z.S.

#### Notodontidæ.

##### *Stauropus dambæ*, sp. n.

♀. Head and thorax chocolate-brown, with a large admixture of greenish rough scales. Primaries creamy grey, thickly irrorated with green and dark red-brown scales; the postmedian deeply crenulate line, more or less obscured, is dark red-brown; submarginal line dark red-brown, deeply waved, prominent, and continued along the fold across the middle of the cell and less distinctly along the costa; this somewhat unusual marking should serve to easily discriminate the species. Secondaries pale brown, with the usual *Stauropus* apical mark.

Expanse 47 mm.

*Hab.* Damba Island, on the Equator in the Victoria Nyanza, 20 miles south-east of Entebbe.

Type in the Oxford Museum.

Dr. Carpenter found the larva on April 12th; it spun up on the 14th of that month, and the imago emerged on May 2nd following.

*Peratodonta bella*, sp. n.

♂. Head and face tawny brown; collar prominent, ochreous, broadly tipped with tawny brown; thorax purplish grey, with patagia pinkish; abdomen with dorsum pinkish grey; ventral surface purplish grey. Primaries with dark linear costa, below which they are tawny brown, gradually becoming paler and shading off into pale pinkish, and in parts of the cell to cream-colour; an oblique more or less wedge-shaped patch of dark tawny brown occupies the terminal area, beginning in a fine line in the apex and getting rapidly wider to vein 2; below vein 2 the whole of the inner margin is pale tawny ash-colour; in the middle of the terminal area is an irregular, pale bright olive-brown, tooth-shaped mark extending shortly upwards towards the apex. Secondaries uniform cream-colour.

♀. Like the male, but without the sharp contrasts, the colours being duller, more uniform, the terminal area being pinkish rather than tawny, whilst the secondaries are darkish brownish grey; the last segment of the abdomen has a pale ash-grey tuft.

Expanse, ♂ 38, ♀ 49 mm.

*Hab.* Oni, 70 miles E. of Lagos.

Types in the Oxford Museum.

Male taken by W. A. Lamborn in the verandah of his house at Oni Camp, 4 P.M., Sept. 9, 1911; the female at 3 P.M. on Sept. 10. A second male was taken in the same position at 4 P.M. on Sept. 9. Mr. Lamborn is confident that all three specimens had emerged from the pupæ of captured larvæ that had escaped. Mr. Lamborn also captured a third male at rest on the upperside of a leaf in the forest, 1 mile east of Oni, March 23, 1911. All four specimens appeared in the wet season, which lasted from March 15 to Dec. 8, 1911.

*Arctiadæ.**Acantharctia rubrifemora*, sp. n.

Head, face, thorax, abdomen, and both wings pure white; legs white, with bright red femora above. Primaries with all the veins edged with pale greyish brown. Secondaries spotless.

Expanse 45 mm.

*Hab.* Damba Island, Uganda.

Type in the Oxford Museum. Bred by Dr. Carpenter, June 25, 1911, from a larva which spun June 9.

*Lymantridæ.**Lælia rogersi*, sp. n.

♀. Head, thorax, and abdomen creamy grey. Primaries pale ochreous grey, with three parallel, oblique, wavy darker lines; basal area paler grey. Secondaries subhyaline whitish, without any marks.

Expanse 35 mm.

*Hab.* Fort Hall (Kikuyu), B.E. Africa.

Type in the Oxford Museum. Taken by the Rev. K. St. A. Rogers on March 20, 1907.

*Lælia acuta*, sp. n.

♀. Head and thorax pale rufous brown; abdomen dirty cream-grey. Primaries pale rufous brown, somewhat paler on the fold and in the postmedian area, the only mark being an obscure dark greyish oblique stripe from the costa close to the apex to near the middle of the cell. Secondaries pale straw-colour.

Expanse 36 mm.

*Hab.* Damba Island, Uganda.

Type in the Oxford Museum. Bred Sept. 24, 1911, from a larva found by Dr. Carpenter.

*Cifuna nigroplagata*, sp. n.

♀. Head, thorax, abdomen, and both wings dull cinnamon-brown. Primaries with a large blackish patch at the end of the cell extending to the costa; from the angle of vein 3 an obscure trace of an oblique darker stripe to the middle of the inner margin; a trace of a submarginal irregular line, with some dark points in the upper radial portion; fringes darkly intersected. Secondaries with an obscure dark dash closing the cell; a submarginal indefinite irregular band of darker shading; fringes unicolorous.

Expanse 36 mm.

*Hab.* Damba Island, Uganda.

Type in the Oxford Museum. Bred July 12, 1911, from a larva found by Dr. Carpenter. The cocoon was spun July 1.

*Dasychira geoffreyi*, sp. n.

♂ ♀. Head and thorax grey, very finely irrorated with brownish; abdomen ochreous grey. Primaries pale ochreous grey, with fine brown irrorations sparsely spread in the cell



and fold, very thick on the costa and beyond the cell in the costal area, but less thick on the terminal area; a trace of a basal irregular line; a darkly outlined spot closing the cell, with a crenulate postmedian fine dark line; termen and fringes darkly spotted. Secondaries ochreous grey, becoming greyer towards the termen.

Expanse, ♂ 38, ♀ 50 mm.

*Hab.* Damba Island, Uganda.

Types in the Oxford Museum. Bred from larvæ found by Dr. Carpenter. First cocoon was spun May 4, 1911; the first emergence occurred May 17-18.

There is one specimen much more prominently and darkly marked, so that it is possible there may be a fair range of variation with this species, as is the case with some others of the genus.

*Dasychira umbrensis*, sp. n.

♂ ♀. Head, thorax, abdomen, and both wings dull darkish brown, of a mottled appearance, with very little definite marking. Primaries with three dark dots at the lower angle of the cell arranged in an inverted triangle; an obscure, dark, irregular, strongly serrate postmedian line; a series of submarginal interneural dark spots; fringes spotted in both wings. Secondaries uniform in colour.

Expanse, ♂ 43, ♀ 48 mm.

*Hab.* Damba Island, Uganda.

Types in the Oxford Museum. Bred from larvæ found by Dr. Carpenter. First cocoon was spun July 15, 1911, and the first moth emerged July 26.

*Dasychira carpenteri*, sp. n.

♂. Primaries very pale grey, with a dark basal line, highly dentate; a double irregular median line, enclosing a whitish space in which is a dark dot; the outer line is highly scalloped; beyond this is another interrupted serrate line; cell closed by a dark crescent, with a small spot in the crescent, above which and slightly further out is a dark costal patch, followed by a double crenulate postmedian line; termen with an irregular series of dark spots; the wing is dusted a good deal with very fine brownish scales. Secondaries straw-yellow, with a broad darkish border tapering down to the anal angle.

♀. Similar to the male, but darker grey, with the lines less prominent and with the crescent-shaped mark closing the cell developed into a fair-sized spot.

*Ann. & Mag. N. Hist.* Ser. 8. Vol. xii.

5

Expanse, ♂ 40, ♀ 50 mm.

*Hab.* Damba Island, Uganda.

Types in the Oxford Museum.

The male and female were captured *in copulâ* by Dr. G. D. H. Carpenter in the first half of June, 1911, on the shore on the E. side of Damba Island. Dr. Carpenter has also bred a series of seven specimens from larvæ taken on Damba Island. Cocoons were first spun June 3, 1911, and the first moth emerged June 13. Three specimens, apparently of this species, exist unnamed in the British Museum. The locality given is Ilesha, N. Nigeria.

### Agaristidæ.

#### *Schausia flavifrons*, sp. n.

♂. Both wings black, with white patches. Primaries with a white basal point; a small white subovate patch in the cell; a large, long, oblong postmedian patch; a leaden basal stripe; a very oblique leaden stripe across the hinder third of the cell; cell closed with a leaden crescent; an oblique leaden subapical stripe and a trace of one below the costa. Secondaries with a large subhyaline white central patch to well beyond the cell. Palpi, frons, collar, and pectus bright orange.

Expanse 48 mm.

*Hab.* Mombasa.

Type in the Oxford Museum. Collected by the Rev. K. St. A. Rogers on March 13, 1906.

### Lasiocampidæ.

#### *Gastroplakæis idakum*, sp. n.

♀. Head, face, and terminal segments of abdomen pale orange-grey; thorax and abdomen pale ochreous grey, the latter being the paler. Primaries pale ochreous grey, irrorated finely with darker grey; costa finely ashen grey, with an enlarged ashen area in front of the apex; a trace of a fine grey, crenulate, median line; the fine, very oblique, crenulate postmedian line is grey, and is followed by an irregular very oblique line of grey shading; a blackish spot closes the cell. Secondaries uniform pale straw-colour.

Expanse 60 mm.

*Hab.* Idakun, 4 miles N.W. of Oni Camp (Lagos district).

Type in the Oxford Museum. The larvæ were found by W. A. Lamborn on the 2nd of February, 1912; they spun

their cocoons on the 7th, and emerged on the 23rd of March in that year.

Mr. Lamborn's note, dated 24th March, 1912, is as follows:—"The larvæ were pale green in colour, with a median longitudinal black band on the dorsal aspect, and they were covered with short hairs. The thoracic legs were brilliant scarlet. When one touched a larva it suddenly threw back the anterior portion of its body, bringing the ventral surface uppermost, so that the legs were prominently displayed. They were then quivered violently."

Three larvæ, all of the same age, were found on one small plant, growing at the side of a forest-path.

### Zygænidæ.

#### *Saliunca egeria*, sp. n.

♂. Head, antennæ, thorax, and abdomen black; patagia chestnut-brown. Primaries chestnut-brown, rather darker on the fold and towards the termen; a long, dusky, wedge-shaped mark between veins 5 and 8, rapidly tapering through the cell. Secondaries uniform sooty brown.

Expanse 30 mm.

*Hab.* Bugalla, Sesse Islands, in the N.W. of the Victoria Nyanza.

Type in the Oxford Museum.

This specimen, the only one seen by Dr. Carpenter, was captured at rest on a grass-stem, Jan. 21, 1912, in an open grassy area on the island. Dr. Carpenter notes that at rest the wings are disposed flat over the back, with costal margins [? inner margins] loosely apposed. In this attitude the moth closely resembles some of the Lycid beetles which are common on the island.

### VII.—Descriptions of Four new Fishes discovered by Mr. G. L. Bates in the Nyong River, S. Cameroon. By G. A. BOULENGER, F.R.S.

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#### *Clarias oxycephalus*.

Depth of body 6 times in total length, length of head  $4\frac{2}{3}$  times. Head  $1\frac{1}{2}$  times as long as broad, tapering in front,  $5\frac{2}{3}$

snout obtusely pointed, upper surface smooth; occipital process angular, as long as broad; frontal fontanelle twice as long as broad, larger than the occipital fontanelle, which is anterior to the occipital process; eye 3 times in length of snout,  $4\frac{1}{2}$  times in interorbital width, which exceeds width of mouth and is  $\frac{2}{3}$  length of head; band of præmaxillary teeth  $3\frac{1}{2}$  times as long as broad; vomerine teeth conical, forming a crescentic band which, in the middle, is a little broader than the præmaxillary band. Nasal barbel as long as head; maxillary barbel  $1\frac{2}{3}$  times as long as head, reaching beyond pectoral; inner mandibular barbel  $\frac{5}{8}$  length of head, outer  $1\frac{1}{4}$ . Gill-rakers thick, 16 in number. Clavicles striated, covered with a thin skin. Dorsal 100, its distance from occipital process  $\frac{1}{3}$  length of head, very narrowly separated from caudal. Anal 75, very narrowly separated from caudal. Pectoral  $\frac{1}{2}$  length of head, the spine serrated on both sides and  $\frac{2}{3}$  the length of the fin. Ventral  $1\frac{2}{3}$  times as distant from caudal as from end of snout. Caudal  $\frac{1}{2}$  length of head. Uniform olive.

Total length 225 mm.

A single specimen.

This new species is to be placed near *C. werneri*, Blgr., from which it differs principally in the more pointed snout.

#### *Auchenoglanis longiceps.*

Depth of body 6 times in total length, length of head  $3\frac{1}{4}$  times. Head moderately depressed, nearly twice as long as broad, its upper surface smooth; occipital process small, longer than broad, well separated from the feebly developed interneural plate; snout pointed, a little more than  $\frac{1}{2}$  length of head; eye supero-lateral, 8 times in length of head,  $2\frac{1}{2}$  times in interorbital width; mouth small, inferior, with thick papillose lips; præmaxillary teeth in a small reniform group. Maxillary and inner mandibular barbels not quite  $\frac{1}{2}$  length of head, outer mandibular nearly as long as head. Gill-rakers moderately long, 6 on lower part of anterior arch. Humeral process narrow, pointed, smooth. Dorsal I 7; spine strong, smooth,  $\frac{3}{5}$  length of head; longest rays  $\frac{3}{4}$  length of head. Adipose dorsal 5 times as long as deep, nearly twice as long as its distance from rayed dorsal, not extending to root of caudal. Anal 12 (8 rays branched). Pectoral not reaching ventral, ventral not reaching anal. Caudal rounded. Brownish, with round black spots forming four longitudinal series on the body; belly white; dorsal and caudal fins with numerous round black spots.



Total length 200 mm.

A single specimen.

Distinguished from *A. ballayi*, Sauv., by the longer, narrower head.

*Synodontis steindachneri.*

Depth of body 4 times in total length, length of head  $3\frac{1}{3}$  times. Head  $1\frac{1}{4}$  times as long as broad, rugose above behind snout, which is obtusely pointed and as long as post-ocular part of head; eye supero-lateral, 5 times in length of head,  $1\frac{3}{4}$  times in interorbital width; lips moderately developed; præmaxillary teeth forming a short and broad band; movable mandibular teeth  $\frac{2}{3}$  diameter of eye, 25 in number. Maxillary barbel with a broad marginal membrane at base, as long as head, reaching a little beyond base of pectoral spine; outer mandibular barbel about twice as long as inner, former with long slender branches, latter with ramified branches. Gill-openings not extending downwards beyond root of pectoral spine. Occipito-nuchal shield rough like the occiput, very obtusely tectiform,  $1\frac{1}{2}$  times as long as broad, with rounded posterior processes. Humeral process acutely pointed, longer than broad, granulate, without keel, extending as far back as occipito-nuchal process. Dorsal I 7; spine as long as head, feebly curved, striated, with feebly retrorse serræ in front in its upper part, strongly serrated behind. Adipose dorsal 3 times as long as deep, as long as its distance from rayed dorsal. Anal IV 6, obtusely pointed in front. Pectoral spine slightly shorter than dorsal, not reaching ventral, strongly serrated on outer border, very strongly on inner. Caudal deeply forked, upper lobe the longer. Caudal peduncle as long as deep. Dark olive-brown, body finely speckled with black.

Total length 150 mm.

A single specimen.

This species, named in honour of Dr. Steindachner, who has quite recently contributed to our knowledge of the fishes of Cameroon, is allied to *S. obesus*, Blgr., and *S. robbianus*, J. A. Smith, but distinguished from both by the shorter maxillary barbel and the shorter adipose fin.

*Pelmatochromis caudifasciatus.*

Depth of body nearly equal to length of head, 3 to  $3\frac{1}{4}$  times in total length. Head twice as long as broad; snout rounded, with convex upper profile, a little broader than long, as long as or slightly longer than eye, which is  $3\frac{1}{4}$  to  $3\frac{1}{2}$

times in length of head, 1 to  $1\frac{1}{4}$  times in interorbital width, and a little exceeds præorbital depth; mouth extending to between nostril and eye; teeth small, in 3 or 4 series, 40 to 60 in outer series of upper jaw; 3 or 4 series of scales on the cheek, width of scaly part a little less than diameter of eye. Gill-rakers short, tubercular, 7 to 9 on lower part of anterior arch. Dorsal XIV–XVI 9–11; spines increasing in length to the last, which measures  $\frac{2}{3}$  to  $\frac{1}{2}$  length of head; longest soft rays shorter than head. Anal III 7–8; third spine as long as last dorsal. Pectoral  $\frac{2}{3}$  to  $\frac{3}{4}$  length of head, not reaching origin of anal. Ventral produced into a filament, reaching vent, origin of anal, or a little beyond. Caudal rounded. Caudal peduncle a little deeper than long. Scales cycloid, 27–29  $\frac{2-2\frac{1}{2}}{10-11}$ ; lateral lines  $\frac{18-21}{7-9}$ . Brown above, yellowish beneath; a more or less distinct dark band from the eye to the root of the caudal, crossed by 7 to 9 rather faint dark bars, which expand into round black spots where they meet the lateral band on the caudal part of the body; dorsal with round dark spots and a black and white edge; anal with round dark spots, which often form oblique bands; caudal with numerous dark bars, the upper rays with a black and white edge; ventrals white.

Total length 105 mm.

Several specimens. Also obtained by Mr. Bates in the Ja and Bumbe Rivers.

Very closely allied to *P. nigrofasciatus*, Pellegr. Distinguished by fewer gill-rakers and by the coloration.

VIII.—*On the Presence of Two closely allied Species of Toads of the Genus Nectophryne in Cameroon.* By G. A. BOULENGER, F.R.S.

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A FEW years ago Mr. G. L. Bates pointed out to me that two distinct though very closely allied species of *Nectophryne* occur together near Bitye, and are to be distinguished by the shape of the snout. I felt some diffidence at first in proposing a new name for the individuals differing from Peters's figure of *N. afra* by the shorter and less prominent snout; but a considerable number of specimens since received from Mr. Bates compel me to endorse his opinion that the Bitye specimens should be referred to two species; the short-snouted

requires a name, than which one recalling its discoverer could not be more appropriate.

The outline-figures here given sufficiently indicate the difference between the two species. The snout of *N. batesii*, sp. n., is shorter than that of *N. afra*, and, seen from below, projects far less considerably beyond the mouth; seen in profile, it is much less obliquely truncate. I have failed to detect any other differences, but I note that the markings are subject to much less variation in *N. batesii* than in *N. afra*, and that the belly and the lower surface of the limbs are always uniform yellow or yellowish white, brown spots or



Head of *Nectophryne afra*.

Head of *Nectophryne batesii*.

marblings, if present, being confined to the throat and breast. Upper parts pale pinkish brown to dark brown, with three or four more or less distinct darker blotches on the head and back, one of which often forms a bar on the sacral region; sides of back often lighter; a dark band on the loreal and temporal regions; hind limbs sometimes with ill-defined dark cross-bands. The largest specimen measures 25 mm. from snout to vent.

*N. batesii* is only known from the neighbourhood of Bitye, on the Ja River (Congo System), where *N. afra* is also common. Of the latter species I have examined specimens from Spanish Guinea, Cameroon (Kribi, Akok, Efulen, Zima Country, Bitye), Fernando Po, and Southern Nigeria (Oban hills).

Bearing in mind that some of the East-African species of *Nectophryne* are known to be viviparous, I have opened several females of both *N. afra* and *N. batesii*, the belly of which was distended with ripe ova; these, of enormously large size ( $2\frac{1}{2}$  mm. in specimens measuring 20 to 25 mm. from snout to vent), showed, however, no sign of development. Mr. Bates has sent me a specimen, a female *M. batesii* with

empty oviducts, found by him at Bitye, Aug. 12, 1909, under the trough or hollow of a plantain-leaf petiole, crouched in the midst of a mass of eggs. It is therefore pretty certain that this species is not viviparous, and that the eggs develop on land without the young passing through a larval stage.

IX.—*Description of a new Snake discovered by Mr. A. E. Pratt in Eastern Peru.* By G. A. BOULENGER, F.R.S.

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*Leptognathus latifasciatus.*

Body strongly compressed. Eye large, its diameter double its distance from the oral border. Rostral a little broader than deep, just visible from above; internasals half as long as the præfrontals; frontal slightly broader than long, shorter than its distance from the end of the snout, half as long as the parietals; nasal divided; loreal as long as deep, bordering the eye; a præocular, separating the præfrontal from the eye; two postoculars; temporals 2+3 or 1+3; nine upper labials, fourth, fifth, and sixth entering the eye; first two pairs of lower labials forming a suture behind the symphysial; three pairs of chin-shields, nearly as long as broad. Scales in 15 rows, vertebrals strongly enlarged, but not broader than long. Ventrals 191; anal entire; subcaudals 106. Anterior part of body with broad blackish-brown annuli separated by cream-coloured interspaces two scales in width; further back the blackish annuli are interrupted on the belly, and towards the posterior part of the body they become narrower and white-edged, separated by broad reddish-brown interspaces; belly closely speckled and spotted with blackish-brown, uniform brown behind; head dark brown above, with yellowish dots and vermicular lines; upper lip with narrow white vertical bars.

Total length 430 mm.; tail 125.

A single specimen, from the Upper Marañon.

Closely allied to *L. peruana*, Boettg., and *L. variegata*, D. & B.

This is the second species of *Leptognathus* discovered by Mr. Pratt, a *L. pratti*, from the Andes of Colombia, having been described by me in these 'Annals' in 1897.



X.—*Note on an interesting Abnormality in Echinus esculentus.* By HERBERT L. HAWKINS, M.Sc., F.G.S., Lecturer in Geology, University College, Reading.

DURING the preparation of a series of young Echini collected at Port Erin, Isle of Man, a small specimen of *E. esculentus* was found with an abnormal development of considerable interest. Abnormalities often give indications of morphological features that are not apparent in normal cases—a fact that has been shown recently by Jackson ('Phylogeny of the Echini,' Boston, 1912). He gives an analysis of the various types of abnormality commonly found, and the case here described seems to correspond with his "*progressive*" series.

The specimen is not quite circular—this disturbance of symmetry being a frequent indication of some more deep-seated irregularity. The peristome is not central, although neither in this case nor in that of the ambital outline is the departure from the normal very noticeable. The diameters of the test, taken from the middles of the ambulacra to the middles of the opposite interambulacra, are:—

	mm.
I.-3 .....	24·75
II.-4 .....	24·0
III.-5 .....	24·5
IV.-1 .....	24·0
V.-2 .....	24·25

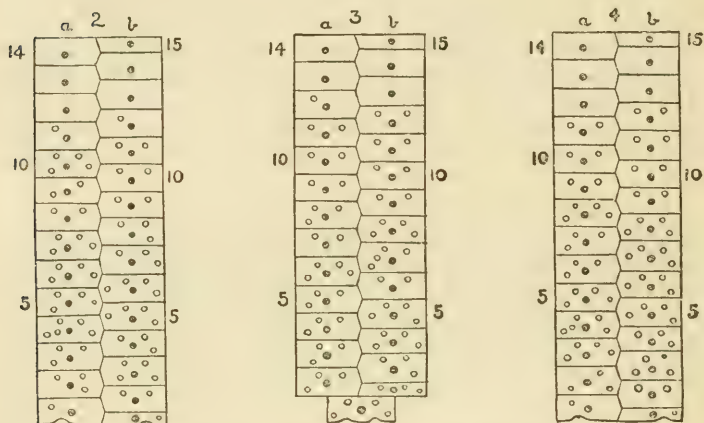
The distance of the peristome from the ambitus is 7·5 mm. in area 3 and 6·5 mm. in I.

From the adapical surface no special irregularity (other than the elliptical outline) can be seen, the apical system being perfectly normal. An adoral view shows that interambulacrum 3 is very narrow at the peristome-margin, ambulacra III. and IV. almost meeting across it. A closer examination shows that the interambulacrum is composed of a single plate at the peristomial end. All the other four areas are normally double throughout.

In all Regular Echinoids whose early postlarval development is known the interambulacra originate as single plates. This was admirably shown by Lovén for *Cidaris* ('Echinologica,' 1892). The single plate is early lost by resorption. It might be thought, therefore, that in interambulacrum 3 of this specimen the primitive plate had not been resorbed in the usual way. But this seems not to be the case. A

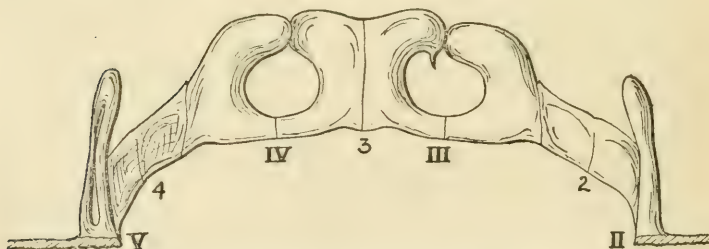
comparison of the plans of the two neighbouring areas with that of the area affected (fig. 1) shows that in all three there are the same number of plates in each column (if the single one is counted as belonging to both columns). Supposing that the single interambulacral only has been resorbed in the

Fig. 1.



Plans of one abnormal and two normal interambulacral areas of *Echinus esculentus*.

Fig. 2.



Part of perignathic girdle of abnormal *Echinus esculentus*.

normal areas, then the abnormal area must have developed two such plates in succession, one having been lost in due course. Such a development might be regarded as *arrested* (towards *Bothriocidaris*) or *progressive* (towards some advanced Spatangoids). In view of the effect of the abnor-

mality on the perignathic girdle, I am inclined to refer it to the latter category.

There is no further abnormality in interambulacrum 3, as a comparison of the tuberculation of the three areas (fig. 1) shows.

The most interesting feature of the specimen is the effect produced by the abnormality on the perignathic girdle. When the specimen was cut in half, the girdle showed the features indicated in fig. 2. The two ambulacral processes of the auricles bordering on interambulacrum 3 have coalesced in the absence of the separating ridge, the joint product showing traces of a median suture. The other two processes of the auricles affected are practically normal, but do not meet their fused fellows quite regularly, though connected to them.

At first sight the compound "process" derived from the two fused auricular elements suggests a comparison with the interrarial auricle of *Cidaris*. There can, however, be no doubt that this resemblance is deceptive. Both sides rise chiefly from the ambulacra, thus being true "processes" in the sense of Duncan, as distinct from ridges. But they both rest *in part* on the single interambulacral plate, on to which they have apparently transgressed from the ambulacra.

Now in the Clypeastroida the first single interambulacral plate is retained throughout life (in the absence of any important peristomial resorption), and the auricle is interrarial in position. H. L. Clark has recently shown that the apparently single auricle of *Echinocyamus* is in reality a double structure, composed of two species which seem to have migrated from an ambulacral position. Here, then, in an area of *Echinus* in which a single plate is abnormally retained, we find developed a perignathic structure which is strictly comparable with that of the far more highly specialized Clypeastroida. The abnormality is thus clearly shown to be *progressive* in tendency.

It is fairly certain that *Echinus* is in no way ancestral to the Clypeastroids, although in many respects it resembles their ancestors more than they. *Echinus* is then, in many structures, *retarded* in evolution when compared with the *accelerated* features of *Echinocyamus*. We find in this specimen that an accidental similarity in one structure between two originally homogenetic but widely divergent groups gives rise to a corresponding convergence of character in another structure. This fact lends support to the view I have recently put forward (Geol Mag., May 1913) that the

evolution of structure is often to some degree independent of that of the complete organism.

Unfortunately the lantern was destroyed before the interest of the specimen was appreciated.

The specimen is now in the Zoological Museum of University College, Reading (registered no. 535).

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XI.—*Descriptions of new Species belonging to the Homopterous Family Cicadidæ.* By W. L. DISTANT.

*Ioba bequaerti*, sp. n.

Head, pronotum, and mesonotum olivaceous; head with the area of the ocelli connected with the lateral margins by an oblique fascia, and a spot at anterior angles before front black; pronotum with two central spots (one on anterior margin, the other on inner edge of broad posterior margin), the fissures, and a basal spot to the lateral angulated expansions; mesonotum with two small obconical spots on anterior margin, and a central elongate spot black; abdomen above testaceous, first and second segments almost entirely and basal margins of remaining segments piceous; body beneath more or less olivaceous; a large transverse spot connecting face with eyes, apex of face, clypeus, about apical half of rostrum, tarsi, and central transverse segmental spots to abdomen black; tegmina semiopaque, talc-like, base to a little beyond basal cell fuscous, thence to about basal third greyish opaque, the veins brownish ochraceous or violaceous, transverse veins at bases of apical areas and a double series of small spots near apices of apical veins fuscous, a transverse fuscous spot at apex of and beyond radial area, the costal membrane more or less virescent; wings palely greyish opaque, the basal and apical areas fuscous, the veins greyish, the membrane pale hyaline; head frontally produced, not truncate, above about as long as pronotum (excluding its posterior margin), longitudinally impressed on the area of the ocelli, prominently pilose before front and behind eyes; pronotum with its lateral margins medially angularly expanded, the angular apices reaching nearly to the apices of basal cells of tegmina; rostrum reaching the posterior coxæ; opercula slightly overlapping internally, not extending beyond base of abdomen; posterior tibiæ longly spinulose.



Long., excl. tegm., ♂, 27 mm.; exp. tegm. 80 mm.

*Hab.* Belgian Congo, Sankisia (*Dr. Bequaert*, Mus. Congo Belge).

Allied to *I. horizontalis*, Karsch, from which it differs by the less produced and less angulate lateral pronotal margins, the narrower, more elongate, and attenuate tegmina, &c.

*Munza sudanensis*, sp. n.

Head with the front and vertex piceous, the basal margin of the latter ochraceous; pronotum ochraceous, a central longitudinal fascia, which is widened at base and apex, and the fissures piceous or black; mesonotum ochraceous, with four obconical spots on anterior margin, of which the two central ones are moderate in size and the outermost ones much the longest, the area in front of the cruciform elevation and the apical angles of the latter piceous or black; abdomen above pale fuscous, with a central longitudinal testaceous fascia and the extreme posterior segmental margins ochraceous, abdomen beneath without the central fascia; sternum, legs, and opercula ochraceous; face ochraceous, its anterior area and a central longitudinal fascia black and with two contiguous ochraceous spots at anterior margin; rostrum reaching the abdominal margin, its apex black; tegmina fuscous brown, about apical half of radial area, the centres of two upper ulnar areas and spots to remaining ulnar areas, an oblique macular fascia crossing apical areas, and spots on apical margin greyish white, semiopaque, and talc-like; wings ochraceous, their apical and posterior margins fuscous, the membrane hyaline; head (including eyes) about as wide as base of mesonotum, not frontally produced, more or less truncate; outer and posterior membranous margin to wings broad, about one-third their length; opercula in male reaching base of abdomen, their margins rounded, their inner angles not meeting but distinctly separate.

Long., excl. tegm., ♂, 18 mm.; exp. tegm. 50 mm.

*Hab.* Anglo-Egyptian Sudan; Benemana River, Yei to Meredi, Lado District (Brit. Mus.).

Allied to *M. basinacula*, Walk., but with the opercula distinctly separated, not overlapping as in Walker's species; pattern of tegmina also different.

*Platypleura schoutedeni*, sp. n.

Head, pronotum, and mesonotum ochraceous, with black markings; head with two transverse fasciæ, one above the insertions of the antennæ, the other between the upper

margins of the eyes and including the area of the ocelli, and the hind margins to the eyes; pronotum with the anterior and subposterior margins, a central longitudinal fascia, and the fissures; mesonotum with four obconical spots, the two central ones of which are smallest and the two lateral ones largest, and a large cruciform spot in front of the cruciform elevation, black; abdomen above black, the posterior segmental margins narrowly ochraceous; head beneath and sternum ochraceous, with black markings; a transverse fascia between the eyes crossing upper area of face, central sulcation to face, lateral areas of clypeus, and base of prosternum black; opercula and abdomen beneath piceous, the posterior segmental margins ochraceous; tegmina semi-hyaline, talc-like, basal area (including basal cell), an oblique fascia at about one-fourth from base, a more curved fascia near middle, a short inwardly oblique fascia before apex, and a double series of small obscure spots near the apices of longitudinal veins to apical areas pitchy black; wings fulvous, the veins on posterior area and a broad outer margin not reaching the outer membrane, black; rostrum with its apex piceous and slightly passing the posterior coxæ; opercula slightly extending beyond anterior margin of basal abdominal segment at its lateral angles, lateral and posterior margins oblique, their interior angles rather strongly overlapping; face broadly, centrally, longitudinally sulcate, the lateral areas strongly transversely striate.

Long., excl. tegm., ♂ 23, ♀ 19 mm.; exp. tegm., ♂ 70, ♀ 65 mm.

*Hab.* Belgian Congo Region, Kalengwe and Sankisia (*Dr. Bequaert*, Congo and Brit. Mus.).

Allied to *P. severini*, Dist., and *P. laticeps*, Karsch.

*Var.*—Resembling typical *P. schoutedeni*, but differing principally in the coloration of the wings, in which the black outer margin is much broader, the base also of the same colour, thus restricting the fulvous coloration to a quadrangular discal spot; the tegmina have the spots near the apices of longitudinal veins to apical areas larger and more distinct.

Brit. Centr. Africa; Zomba (*H. S. Stannus*, Brit. Mus.).

### *Platypleura seraphina*.

*Platypleura seraphina*, Dist. Trans. Ent. Soc. Lond. 1905, p. 193.

I described this species from a specimen received from French Guinea, the type of which is in the Paris Museum. The British Museum now possesses a specimen taken in Uganda (Polebek) by Mr. W. P. Lowe.

*Platypleura maritzburgensis*, sp. n.

Head, pronotum, and mesonotum brownish ochraceous; eyes black; mesonotum with four obconical spots, the central pair shortest; abdomen above black, a central longitudinal fascia (widest at base) brownish ochraceous, apical segment greyish; body beneath and legs brownish ochraceous, the opercula cretaceously tomentose; tegmina opaque, greyish brown, with darker mottlings, basal area more brownish ochraceous, costal membrane ochraceous, an ill-defined, obscure, greyish macular fascia commencing at middle of upper ulnar area and terminating on lower apical area; wings brownish ochraceous, outer membrane greyish, the apex and outer margin piceous; pronotal lateral margins rounded, not angulate; rostrum reaching the posterior coxæ, its apex black; face broadly but not deeply longitudinally centrally sulcate, its lateral areas transversely ridged; opercula in ♂ almost meeting internally, their lateral and posterior margins rounded.

Long., excl. tegm., ♂, 15 mm.; exp. tegm. 44 mm.

*Hab.* Natal; Maritzburg (*E. Warren*, Natal and Brit. Muss.).

Allied to *P. deusta*, Thunb.

*Platypleura nigrosignata*, sp. n.

Head, pronotum, and mesonotum pale ochraceous; head with a transverse fascia between the eyes, basal margin of front, inner margins of eyes, and a linear marginal spot to vertex above the insertion of antennæ black; pronotum with the sublateral margins and three small central spots—one near anterior margin and two near posterior margin—black; mesonotum with four obconical spots, of which the central two are smallest, a central longitudinal lanceolate spot, and a rounded spot at anterior angles of cruciform elevation black; abdomen above black, with greyish and ochraceous pile, tympanal coverings fulvous; body beneath thickly greyishly pilose; anterior margin of head between face and eyes, face, and abdomen beneath black, the transverse facial ridges, coxæ, legs, rostrum, opercula, and posterior segmental margins more or less ochraceous; tegmina more or less fulvous, a transverse fascia beyond middle, and a subapical patch a little darker; these dark markings are margined with greyish, basal cell shining black; wings ochraceous, a discal fascia crossing the bases of the upper five apical areas and the apical and posterior margins castaneous; head



somewhat short and broad; face profoundly centrally longitudinally sulcate, the transverse ridges prominent; rostrum reaching the posterior coxæ, its apex black; opercula not passing base of abdomen, meeting at their inner angles, lateral and apical margins oblique, the former moderately sinuate.

Long., excl. tegm., ♂ 20 mm.; exp. tegm. 60 mm.

*Hab.* Indo-China (*R. Vitalis*).

Allied to *P. mira*, Dist., from Laos.

*Champaka celebensis*, sp. n.

Body above shining castaneous brown, more or less ochraceously pilose; area of the ocelli black; pronotum with a central longitudinal fascia (widened anteriorly and posteriorly) and the fissures dark castaneous, the lateral and basal marginal areas somewhat olivaceous; mesonotum with four obscure dark obconical spots, the central two smallest; abdomen with an obscure, central, longitudinal, narrow, pilose fascia; head beneath, sternum, and opercula dull, opaque, ochraceous; face and legs castaneous, femora black or dark castaneous, their apices, and the basal area of the anterior femora ochraceous; abdomen beneath shining, brownish ochraceous; tegmina and wings hyaline, the venation more or less olivaceous; tegmina with the extreme base, basal cell, and costal membrane more or less olivaceous, the transverse veins at the bases of second, third, fifth, and seventh apical areas, and the posterior longitudinal vein to seventh apical area broadly darkly infusate; head (including eyes) considerably wider than base of mesonotum; abdomen long, length of head equal to space between eyes; rostrum slightly passing the posterior coxæ; opercula almost reaching the posterior margins of the second abdominal segment, attenuated towards apices, which are roundly subacute, widely separated internally; anterior femora with two long and strong spines and a shorter spine near apex.

Long., excl. tegm., ♂, 53–60 mm.; exp. tegm. 135–140 mm.

*Hab.* N.W. Celebes.

Allied to *C. viridimaculata*, Dist., but differing by the larger opercula, different maculation to the tegmina, and absence of the green basal coloration to same, &c.

Two specimens are in the Brit. Mus., presented by Dr. de Giacomini.



*Huechys fascialis*, Walk. Journ. Linn. Soc. Lond., Zool. i. p. 142 (1859).

The type of this species has not been found in the British Museum. The collection of which it formed part originally belonged to Mr. W. Wilson Saunders, though it afterwards passed into the National Collection. Even now I cannot exactly determine it, though we possess a series of specimens from Borneo that nearly answer to the description and which I think must be taken as representing it. But in these the abdomen is piceous brown, not black, and with the segmental margins pale testaceous. The front, face, and mesonotal spots are ochraceous rather than testaceous as described.

## XII.—On new Species of Histeridæ and Notices of others.

By G. LEWIS, F.L.S.

[Plate II.]

THIS is the thirty-ninth paper of this series, and as the types of the Histeridæ described by the late Rev. T. Blackburn are now in the Natural History Museum I have been able to give figures of four very interesting Australian species. Of the genus *Chlamydopsis* and its allies there are now twenty-nine species known.

### List of Species, arranged generically.

Hister omar.	Pheidoliphila sternalis, <i>Blackb.</i>
Atholus ruptistrius.	Chlamydopsis inquilina, <i>Lew.</i>
Pachycærus curtistriatus.	—— comata, <i>Blackb.</i>
—— punctipennis.	—— inæqualis, <i>Blackb.</i>
Aristomorphus, gen. nov.	—— pygidialis, <i>Blackb.</i>
—— rutilus.	—— papuæ.
Hetærius carinistrius.	Saprinus felipæ.

### *Hister omar*, sp. n.

Breviter ovatus, convexus, niger, nitidus; fronte obscure punctulata, stria integra, antice bisinuata; thorace stria marginali integra, stria laterali utrinque abbreviata; elytris striis 1-4 integris, 5-6 ultra medium abbreviatis; propygidio pygidioque minutissime punctulatis; prosterno antice obtuse acuminato; mesosterno fere recto, stria tenuiter impressa; tibiis anticis 4-dentatis.

L.  $4\frac{1}{4}$  mill.

*Ann. & Mag. N. Hist. Ser. 8. Vol. xii.*

6

Shortly oval, convex, black, and shining; forehead obscurely punctulate, with two shallow impressions close to the stria, stria complete and bisinuous anteriorly; the thorax, marginal stria fine and complete, lateral stria well marked, shortened before the base, and anteriorly hamate and ceasing behind the anterior angle; the elytra, subhumeral stria wanting, 1-4 dorsal complete, 5 reaches just beyond the middle, 6 is a little longer; the pygidia have microscopic punctures, with some of a larger grade intermixed; the prosternum, anterior lobe bistriate and obtusely acuminate at its point and slightly bent downwards; the mesosternum is anteriorly nearly straight, but slightly prominent in the middle, the marginal stria is complete but very fine; the anterior tibiæ, apical tooth very robust and minutely bifid at the apex, with three minute teeth behind it; the other tibiæ are multispinous.

The lateral stria of the thorax in this species is a marked characteristic; it may be placed near *H. terre motus*, Lew.

*Hab.* Madura, S. India.

*Atholus ruptistrius*, sp. n.

Ovalis, convexus, niger, nitidus; fronte biimpressa, stria integra retrorsum angulata; pronoto stria marginali antice late interrupta, stria interna pone oculos interrupta; elytris striis integris, 5 cum suturali connexa; propygidio haud dense punctato; mesosterno truncato, marginato; tibiis anticis 3-dentatis.

L. 4 mill.

Oval, convex, black, and shining; the forehead, surface punctulate, with two shallow impressions behind the stria, stria acuminate in the middle; the thorax irregularly punctured at the anterior angles within the stria, marginal stria ceases behind the eyes, lateral stria is markedly broken behind the eyes, but it is continued in a straight line with roughened edges behind the head, towards the base the stria is feebly sinuous and the interstice somewhat widens; the elytra, striæ, inner subhumeral dimidiate and apical, the dorsal striæ are all complete, 5 and sutural join anteriorly; the pygidia are clearly but not closely punctate; the prosternal keel is narrow; the mesosternum is truncate and the stria complete; the anterior tibiæ 3-dentate.

The form of the inner thoracic stria distinguishes this species from its congeners *coalescens*, *14-striatus*, and others. The inner stria resembles that drawn by Marseul for *Platysoma carolinum*, Mon. pl. vii. fig. 14 (1853), but the stria is

not interrupted in *carolinum* as figured by Marseul; Paykull's figure, Mon. pl. x. fig. 2, is good and correct.

*Hab.* Uganda, Central Africa.

*Pachycrærus curtistriatus*, sp. n.

Ovalis, parum convexus, niger, nitidus; fronte impressa, stria integra; pronoto lateribus punctato, stria marginali antice late interrupta; elytris, striis 1-3 integris, 4 et suturali dimidiatis, 5 fore dimidiata; propygidio pygidioque punctatis; prosterno striis brevissimis; mesosterno antice marginato.

L.  $3\frac{1}{2}$  mill.

Oval, a little convex, black, and shining; the head very finely punctulate, frontal stria complete, with a shallow impression behind it; the thorax, marginal stria fine and not continuing behind the head, punctured laterally with some large points and some very fine, disc with only the fine points; the elytra, striæ 1-3 complete, 4 and sutural dimidiate, the fourth has a basal linear appendage, 5 is rather shorter than the fourth; the pygidia are rather coarsely and somewhat closely punctured; the prosternum, striæ short and only intercoxal; the mesosternum is distinctly bordered; the anterior tibiæ are 5-6-denticulate.

This species is the only one known which has short prosternal intercoxal striæ.

*Hab.* Zambise (*H. Swale*).

*Pachycrærus punctipennis*, sp. n.

Oblongo-ovatus, convexus, niger, nitidus; fronte impressa; pronoto punctato, stria marginali integra; elytris striis 1-4 integris, 5 nulla, suturali integra basi hamata, disco punctato; propygidio haud dense punctato; tibiis anticis 5-6-dentatis.

L. 3 mill.

Oblong-oval, convex, black, and shining; the forehead impressed in the middle behind the stria, stria well marked at the sides, anteriorly it is sinuous and not so clearly defined, on the surface anteriorly there are a few microscopic points and along the base of the head there are large scattered punctures; the thorax is evenly not closely punctate, marginal stria complete, behind the head the stria is fine and irregularly crenate; the elytra, striæ 1-4 complete, with more or less crenate edges, and the fourth is punctiform in the apical half, 5 is wanting, sutural is complete and hamate at the base, turning away from the scutellum, the interstice

between the fourth and sutural stria is markedly punctate, some of the punctures are lineal in their arrangement and may represent the fifth stria ; the pygidia are distinctly and evenly but not very closely punctate ; the prosternum, striæ are almost parallel, but widen out very slightly to the base, joining anteriorly only ; the mesosternum, marginal stria complete and rather fine, at the basal angles of the metasternum there is a cluster of punctures ; the anterior tibiæ are 5-6-dentate.

The dorsal punctuation of this species is its most distinctive character ; in outline it resembles *P. modestus*, Lew.

*Hab.* Nyasaland.

#### ARISTOMORPHUS, gen. nov.

Corpus oblongum, subdepressum ; caput declivum, fronte a clypeo haud distincta, antice late emarginata ; pronotum antice angustatum, fossa antennali sub angulo ; elytra striatis, angulis antice prominentibus ; prosternum compressum prominulum haud striatum, lobo antico acuminato ; mesosternum breve, pedibus sat longis, spinulosis, fossa tarsali fere recta.

#### *Aristomorphus rutilus*, sp. n. (Pl. II. fig. 7.)

Oblong, piceous, highly polished, slightly convex above ; legs reddish brown ; the head is declivous, forehead, anterior edge (? clypeus) is widely emarginate, with the angles obtuse and the margin thickened and microscopically rugose, vertex is grooved and pitted and has a median tuft of flavous bristles ; the thorax is narrowest anteriorly, lateral edges with strong flavous bristles, anterior margin has a very fine stria close to the edge, behind it is a second stria which is fine and close to the marginal stria behind the head, but the interstice widens out behind the thoracic angles and is more marked and punctiform, the anterior angles of the thorax are produced similarly to those noted on the head, the base has a fine stria which is close to the edge opposite the scutellum, but gradually leaves it, forming an inverted arch until its ends are lost in the basal depressions, there are two very shallow impressions behind the eyes and two near the basal angles of irregular outline, and there is a longitudinal cluster of small punctures behind the middle of the neck ; the elytra, inner humeral stria very fine and complete, first dorsal well marked and bending inwards towards the base, 2 or 3 sinuous in the dorsal area, and all have wide interstices and are finely punctate in the apical half, and the



interstices are obscurely reddish, the other dorsal striæ are wanting; the propygidium is transversely punctured along its basal half, the posterior half is smooth; the pygidium is reddish, convex and oblong, it is twice as long as broad and impunctate; the prosternum, keel is very narrow and smooth and acuminate anteriorly; the mesosternum has two patches of ferruginous bristles, well separated from each other, on its posterior border; the first segment of the abdomen has a punctate stria along its posterior margin; the legs, the tibiæ are a little dilated with fine bristles on the outer edges, which are bowed, not angulate, the tarsal grooves are nearly straight, and the upper surfaces of all the tibiæ are finely and closely punctulate.

L.  $2\frac{2}{3}$  mill.

*Hab.* Corcovado, Rio Janeiro (*G. F. Bryant*). Taken while flying, 14th May, 1912.

Type in the British Museum.

*Heterius carinistrius*, sp. n.

*Breviter ovatus, nitidus, piceo-brunneus, supra setosus; fronte impressa, dense punctulata, margine elevata; pronoto transverso, margine laterali late incrassato; elytris striis 1-2 integris, basi carinatis, 3-4 apice abbreviatis, basi leviter carinatis, margine postice minute rugosis; propygidio parum dense punctulatis; tibiis angulato-dilatatis.*

L. 2 mill.

Shortly oval, pitchy brown, setose; the forehead opaque and densely punctulate, edges elevated; the thorax is transverse, with an oblique lateral sulcus and a broad thickened margin punctured and a little opaque, broadest anteriorly and slightly sinuous on its outer edge before the base, at the base there is a small elongate elevation and within the sulcus is a basal fovea, the disc is smooth; the elytra, first dorsal stria is complete and distinctly carinate, especially at the base, second complete but less carinate and only at the base, third and fourth striæ are shortened apically and again are less carinate, the apical margin is narrowly and finely rugose; the propygidium is reddish and finely but rather densely punctulate; the pygidium is almost smooth, with a microscopic strigosity at the apex, reddish; the prosternum, striæ widen out at the base and are sinuous before the coxæ, and do not meet anteriorly, being lost in the dense rugosity of the anterior surface of the keel, the sculpture of the keel gradually lessens in density to the base; the mesosternal foveæ are deep; the tibiæ are dilated, especially the intermediate and

posterior pair, and both of these are angulate in the middle, the posterior pair are slightly the broadest.

In *H. brunneipennis* the prosternal striæ are short and very markedly meet in front; in *H. blanchardi* they are very similar to *carinistrius* and the tibiæ are also equally angulate.

*Hab.* Hartford, Connecticut (*K. G. Blair*).

This is the first species discovered on the eastern border of the United States. A single example only in the British Museum.

*Chlamydopsis papuæ*, sp. n. (Pl. II. fig. 6.)

Piceous, above densely and strongly sculptured, a little shining; the head roughly sculptured with two obscure bow-shaped elevations in the median area; the thorax also densely sculptured, the form of the sculpture being distinctly reticulate, the interspaces being elongate or oblong (fig. 6*a*), the anterior edge in the middle is slightly raised and minutely roughened and on each side are two robust dentations, the antennal fossæ lying under the spaces between them, on the vertex there is an obscure bipartite tubercle; the elytra, the elevations of the scutellar region are lobe-shaped and transversely not quite so wide as those figured by Lea for *excavata*, behind the shoulder there is a deep pit which is joined to the corresponding one by a narrow channel passing close to the scutellar elevations, the general surface is sculptured like the thorax, the suture has a fine geminous marginal stria; the pygidia are densely reticulate, but the interspaces are circular or oval, the apex of the pygidium is smooth; the prosternum and mesosternum are densely sculptured like the head, the anterior lobe of the first has a sinuous edge and the marginal stria widens out anteriorly after passing the coxæ, the mesosternum is margined in front; the metasternum is distinctly marked from the mesosternum and has only a single line of punctures along its anterior edge, otherwise it is smooth; the first segment of the abdomen has a row of points anteriorly widely set apart and the posterior edge has a narrow border-line of points which widens out on either side; the tibiæ are slightly dilated and angulate on the outer edge, the anterior and median pair are markedly sculptured, the posterior pair much less so.

*Hab.* Laloki, Papua (*F. Muir*, 1910).

One example in the British Museum.

*Chlamydopsis inquilina*, Lew., 1885. (Pl. II. fig. 2.)

The keel of the prosternum has a very few shallow and

irregular punctures; the meso- and metasterna are somewhat opaque, but are impunctate, with a microscopic strigosity.

*Saprinus felipæ*, sp. n.

Ovatus, niger, nitidus; fronte grosse punctata, stria antice tenuiter impressa; pronoto lateribus punctato, stria marginali integra; elytris striis 1-4 dimidiatis, interstitiis lævibus, postice punctatis; propygidio pygidioque dense punctatis, hoc in medio anguste lævi.

L. 9 mill.

Oval, convex, black, and shining; the head and epistoma markedly and densely punctate, stria rather obscurely marked anteriorly; the thorax, marginal stria complete, and along the sides is a band of coarse punctures, points largest and most dense behind the anterior angle, along the base there is a narrow border of points which do not quite reach the scutellar region; the elytra are striate and similar to those of *lugens*, Er. (Mars. Mon. fig. 34), but their interstices are smooth, the dorsal punctuation is limited to about half the area between the sutural stria (which is shortened anteriorly) and the fourth stria, and outwardly the punctures occupy less space, not encroaching on the striæ; the pygidia are closely punctured, the pygidium has a medium smooth line and at the sides a carinate margin; the prosternum, the striæ are complete, joining at both ends, and widen out before the middle, and are angulate at the widening; the mesosternum, marginal stria lightly impressed but complete, and the suture indicated by punctures.

This species is larger than *S. lugens*, Er., and it is easily distinguished from it by three characters, viz. the interstices of the dorsal striæ are smooth, the pygidium has a smooth median line, and the prosternal striæ are angulate near the middle.

*Hab.* Alpine, Texas (*Wickham*); August 16th.

EXPLANATION OF PLATE II.

*Fig. 1. Pheidoliphila sternalis*, Blackb.

*Fig. 2. Chlamydopsis inquilina*, Lew.

*Fig. 3. — comata*, Blackb.

*Fig. 4. — inæqualis*, Blackb.

*Fig. 5. — pygidialis*, Blackb.

*Fig. 6. — papuæ*, Lew. 6a. Thoracic sculpture.

*Fig. 7. Aristomorphus rutilus*, Lew.

XIII.—*Some new Feræ from Asia and Africa.*

By OLDFIELD THOMAS.

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*Hipposideros lylei*, sp. n.A large species related to *H. pratti*, Thos.

Size rather less than in *H. pratti*. General characters of the *H. armiger* group, including the long feet, development of a posterior transverse crest behind the normal nose-leaf, and the uninflated forehead of the skull. Nose-leaf similar on the whole to that of *H. pratti*, but the supplementary transverse posterior crust higher, attaining 5 mm. at its highest point on each side of its median cleft, and less heavily haired, but the increase in height may perhaps be due to sex; normal transverse crest similarly high in the centre, sloping down laterally, its front surface divided by a prominent median and two indistinct lateral ridges; anterior horseshoe much more deeply notched in front, the median notch nearly 2 mm. in depth, the horseshoe on each side of it forming two forwardly projecting lappets, outside which again there are two shallower notches, unknown elsewhere in the genus. Ears rather narrower than in *pratti*. Tibiæ and feet very long and slender.

General colour dull buffy or clay-colour, washed with brown.

Skull similar in its general characters to that of *H. pratti* as opposed to those of *H. diadema* and *armiger*; but it is smaller throughout, the sagittal crest (though of a male as compared with a female) less developed and less abruptly rising above the forehead; area of forehead smaller and not quite so flat, the median part above the anterior nares slightly elevated, while its postero-lateral portion is somewhat concave internal to the well-marked supraorbital edges. Posterior palate more deeply excavated mesially. Teeth similar in general characters, but smaller throughout.

Dimensions of the type :—

Forearm 78 mm.

Ear  $27 \times 21$ ; third finger, metacarpal 54, first phalanx 25; lower leg and hind foot (c. u.) 51.

Skull: greatest length to front of canine 29; basi-sinual length 18.7; zygomatic breadth 16; interorbital breadth 9.6; mastoid breadth 14; front of canine to back of  $m^3$  11.2; three upper molars together 6.4; three lower molars 10.6.



*Hab.* N. Siam. Type from the Chiengdao Cave, 50 miles north of Chiengmai. Alt. 350 m.

*Type.* Adult male (skin in spirit). B.M. no. 13. 4. 18. 3. Collected January 1913. Presented by Th. H. Lyle, Esq., H.B.M. Consul at Chiengmai.

The Sze-chwan *Hipposideros pratti* being as yet only known from the type specimen, a female, and the present example being a male, it at first sight seemed possible that we had here the unknown male of that species. But further examination shows such differences as to render this impossible, notably the smaller general size, the much smaller teeth (this in a male as compared with a female), and the development of the pendant lappets at the front edge of the horseshoe, not at all likely to be a sexual character.

The type-specimen was obtained in a cave in company with examples of *H. armiger*, as also happened curiously enough with the type of *H. pratti*.

This adds another to the many new Siamese mammals discovered by Mr. Lyle, and I have had great pleasure in connecting his name with it.

*Rhinopoma cystops arabium*, subsp. n.

Like the Egyptian *R. cystops* in all essential characters, but size averaging larger.

Occipito-nasal lengths:—

Mt. Quarantaria, Palestine (*Tristram*): 15·7, 14·9, 15 mm.

Midian (*Burton*): 16, 15·3.

Yemen (*Bury*): 15, 16·4, 15·1, 15·4, 15·6.

Lower Egypt (including the type of *cystops*): 14·7, 15·2, 14·5, 15, 14·3, 15·3, 15.

Dimensions of the type (the italicised measurements taken in the flesh):—

Forearm 56 mm.

Head and body 60; tail 68; ear 16; lower leg and foot (c. n.) 38.

Skull: greatest length 17·6; zygomatic breadth 10·5; mastoid breadth 9·2; front of canine to back of  $m^3$  6·2; breadth between outer corners of  $m^2$  7·9.

*Hab.* Palestine and Arabia. Type from Wasil, Yemen; alt. 4000'.

*Type.* Adult male. B.M. no. 13. 6. 19. 5. Original number 7. Collected 7th March, 1913, by G. W. Bury. Seven specimens.

Although the figures are not very striking, the Arabian

Mouse-tailed Bat is obviously larger on the average than its Egyptian ally. In the type of *R. cystops* the forearm measured 53 mm., head and body 53, and tail 59.

*Rhinopoma muscatellum seianum*, subsp. n.

Like *R. muscatellum* of Muscat, but slightly larger and with markedly larger molars (see skull-dimensions below).

Dimensions of the type (measured on the spirit-specimen):—

Forearm 52.5 mm.

Head and body —; tail 64; ear 15; lower leg and foot (c. n.) 36.

Skull: greatest length 16.3; occipito-nasal length 14.7; zygomatic breadth 9.7; mastoid breadth 8.1; front of canine to back of  $m^3$  6.1; combined length of  $m^1$  and  $m^2$  on outer edge 3 (2.6 in true *muscatellum*); breadth between outer corners of  $m^2$  7.3; transverse diameter of  $m^3$  1.9 (1.5).

*Hab.* Seistan.

*Type.* Adult female. B.M. no. 6. 1. 2. 2. Collected by the Seistan Boundary Commission under Col. A. H. McMahon. Presented by the Indian Museum, Calcutta.

The Seistan *Rhinopoma* has quite the peculiar delicately built skull of *R. muscatellum*, but the teeth are so markedly larger as to indicate subspecific distinction.

*Crocidura doriana fuscata*, subsp. n.

A uniformly chocolate-brown form of the *doriana-nyansæ* group.

Size about as in *C. doriana*, markedly smaller than *C. hedenborgiana*, which it resembles in colour. Upper surface dark "Prout's brown," under surface quite similar, not lighter. Face, hands, feet, and tail still darker, blackish brown.

Teeth closely agreeing in size with those of *doriana*, rather smaller than those of *C. nyansæ*, and conspicuously smaller than those of *C. hedenborgiana*.

Dimensions of the type (measured in flesh):—

Head and body 114 mm.; tail 60; hind foot 19; ear 12.

Skull: greatest breadth across brain-case 12.7; combined length of three upper molars 4.8, of three lower molars 5.5.

*Hab.* Kaka, White Nile.

*Type.* Adult female. B.M. no. 1. 8. 8. 17. Original number 32. Collected 23rd April, 1901, and presented by R. McD. Hawker, Esq.

This is the shrew which in working out Mr. Hawker's collection \* I referred to *C. hedenborgiana*, Sund. Recently, however, the Museum has obtained from Mr. A. L. Butler a much larger species from Roseires, and on application to Prof. Einar Lönnberg I have received such dimensions of the type of *hedenborgiana* as to show that it is the Roseires shrew which should be assigned to Sundevall's species, that from Kaka being therefore still without a name. It is no doubt closely allied to the Abyssinian *C. doriana* †, but may be distinguished by its much darker colour, especially below.

*Felis servalina larseni*, subsp. n.

A form of the Servaline Cat with the shoulders and back unspotted.

General essential characters as in ordinary *F. servalina*, but instead of the body being more or less covered with small black spots, the neck, shoulders, upper arms, and median area of the back are completely and absolutely without spots, as in a lion or *F. chaus*. General colour strong glossy clay-colour, an ill-defined darker band down the back. Sides, belly, and terminal part of limbs spotted, but less conspicuously so than in other forms.

*Hab.* Congo district of N. Angola. Type from near Bembe (about 7° S. and 14° E.).

*Type.* Skin without skull. B.M. no. 13. 3. 24. 1. Collected by Mr. Larsen, and presented by the Rev. J. Sidney Bowskill, of the Baptist Missionary Society.

Mr. Pocock has formed several subspecies for different forms of *F. servalina*, basing them chiefly on the amount of spotting and banding, but this one differs from them all by the complete absence of spots over the greater part of the body, so that seen from above it looks almost more like a unicolor than a spotted cat. The types of all Mr. Pocock's forms are before me, including that of *F. s. liposticta*, but none of them approach *F. s. larseni* in this respect.

The name of the new subspecies is given at the suggestion of the donor, to whom the specimens had been sent by Mr. Larsen, the actual captor.

*Mustela (Lutreola) taivana*, sp. n.

A dark insular form of the *M. sibirica* group.

Size as in *M. quelpartis*, therefore markedly smaller than

\* Ann. & Mag. Nat. Hist. (7) viii. p. 274 (1901).

† Dobs. Ann. Mus. Genov. (2) iv. p. 564 (1887). Type locality, Let Marafia, Shoa.

in continental *sibirica*. General colour uniformly dark otter-brown (near "vandyke-brown"), darker than in *quelpartis* above, and still more so on the sides, which are quite without the strong russet tinge so marked in that animal. Under surface slightly paler, without russet suffusion. Head darker brown; chin irregularly mottled with white on interramia and edges of mouth, but no conspicuous backwardly extended patch is formed, as is the case in *quelpartis*; a small white patch on lower throat. Limbs uniformly brown. Tail longer than in *quelpartis*, brown, its underside with a slight cinnamon suffusion.

Skull about as in *M. quelpartis*; inner lobes of  $m^1$  larger than in that animal.

Dimensions of the type (measured on the skin):—

Head and body 315 mm.; tail 200; hind foot 57.

Skull: condylo-basal length 58.7; zygomatic breadth 30; interorbital breadth 11.7; breadth of brain-case 25.3; palatal length 25.6;  $p^4$ , length on outer edge 6.5;  $m^1$ , breadth 4.6; antero-posterior diameter of inner lobe 3.3.

*Hab.* Formosa. Type from Mt. Arizan; 8000'.

*Type.* Young adult male. B.M. no. 12. 11. 23. 4. Original number 26. Collected March 1912, and presented by Walter Goodfellow, Esq.

This Formosan representative of the Eastern Mink has got the long tail of the continental *M. (L.) sibirica*, with an even more uniformly brown colour than the comparatively short-tailed Quelpart mink, with which it agrees in size.

Swinhoe (P. Z. S. 1870, p. 624) mentions *Mustela sibirica* from Formosa, but did not send home any specimens, so that Mr. Goodfellow's example is the first that the Museum has received from the island.

XIV.—*Notes on the Apidæ (Hymenoptera) in the Collection of the British Museum, with Descriptions of new Species.*  
By GEOFFREY MEADE-WALDO, M.A.

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II. Subfamily *NOMADINÆ*.

THE present paper is a continuation of that published under the same title in Ann. & Mag. Nat. Hist. (8) x. p. 461 (1912).



Besides notes on species already known, nine species are described as new, of which the most interesting are the two new *Epeolus* from Abyssinia.

All the types are in the British Museum.

### CROCISA, Panz.

The species of *Crocisa* from the Oriental-Australian region are partly dealt with by Friese (Zeitschr. Hym. Dipt. pp. 1-12, 1905). Later, the Australian species are tabulated by Cockerell (Entom. News, vol. xviii. p. 46, 1907; and Bull. Amer. Mus. Nat. Hist. xxiii. pp. 232-33).

*Crocisa bidentata*, W. F. Kirby, represented by two male specimens, is a very striking species from the Hari-rud Valley, Afghanistan. In the type the second transverso-cubital nervure is only rudimentary in both wings, but in the other specimen the venation is normal. The abdomen is entirely black, and there does not appear to have been any change in coloration through the agency of spirit, in which the specimens were evidently preserved after capture. The anterior wings are very darkly infuscate, and the pygidium is bituberculate, with a longitudinal keel.

It is curious that another species of *Crocisa* described by Kirby from Sokotra (*Crocisa uniformis*, W. F. Kirby) should have also been a black species. Kohl considers it to be nearly allied to *C. ramosa*, Lep.; it certainly may prove to be a geographical race of that species.

### *Crocisa picta*, Smith.

*Crocisa picta*, Smith, Catal. Hymen. Brit. Mus. ii. p. 277 (1854). ♀.

*Crocisa guineensis*, Rad. Bull. Soc. Natural. Moscou, p. 172 (1893). ♂.

Vachal described the female of *C. guineensis* (Ann. Soc. Ent. France, p. 379, 1903). In *C. picta* there is a longitudinal carina along the whole length of sternite 5, not only at the apex, as Friese states ('Die Bienen Afrikas,' p. 302).

### MESONYCHIUM, Lep. et Serv.

Ducke has recently (Zoolog. Jahrb. p. 106, 1912) synonymised *Melissa*, Smith, with this genus. The species of *Mesonychium* fall into two natural groups, into the second of which, the *Mesoplia* group, fall all the species described by Smith as *Melissa* with the exception of *M. asteria*. This species, which is synonymous with *M. maculata*, Fr., belongs to *Mesonychium*, s. str.

For the sake of convenience a short key to those species of which the British Museum has the types is appended :—

♀ ♀.

- |    |   |   |
|----|---|---|
| 1. | Head or head and thorax with some pale pubescence.....  | 2.  |
|    | Head and thorax with entirely black pubescence. L. 13 mm. (St. Vincent, W. Indies.) .....   | <i>imperiale</i> , Ashm.  |
| 2. | Head and thorax with pale pubescence....  | 3.  |
|    | A tuft of white pubescence on outer side of each antenna and a white fringe on occiput. L. $17\frac{1}{3}$ mm. (Orizaba, S. Mexico.) .....  | <i>insigne</i> , Sm.  |
| 3. | Large size. Wings dark fuscous. A fringe of pale pubescence on prothorax and along the inner side of the tegulae. L. 19 mm. (Brazil, Santarem.) .....   | <i>regale</i> , Sm.   |
|    | Small size (13-14 mm.). Wings subhyaline, fuscous apically .....  | 4.  |
| 4. | Head and mesothorax for the most part clothed with a short, glittering, emerald-green pubescence; face on each side and occiput covered with a long white pile. Abdomen unicolorous, green. L. 14 mm. (Brazil.) ..... | [ <i>itubina</i> , Ducke).<br><i>decoratum</i> , Sm. (= <i>ita-</i> |
|    | Head and mesothorax black; face covered with a short silvery-white pubescence. Abdomen green, laterally with white markings. L. 13 mm. (Brazil, Santarem.) .....  | [ <i>lata</i> , Friese).<br><i>asteria</i> , Sm. (= <i>macu-</i>    |

### EPEOLUS, Latr.

*Epeolus natalensis*, Smith, from Natal, appears to be very near *E. militaris*, Gerst., but is distinct. The type (a male) is not in very good condition and has the apical segments of the abdomen telescoped. The axillar teeth are broader and blunter than in *E. militaris*. The most distinctive character is the presence of a rich brown pubescence on the fifth tergite.

The genus was omitted by Bingham in 'Fauna of British India, Hymenoptera.' At the time of publication (1897) only one species (*E. fervidus*, Smith) was recorded from India, though Cockerell has since added another from the same part of India (Bombay), while a third species from Assam is here described for the first time.

### *Epeolus assamensis*, sp. n.

♂. Niger; facie, pleuris, sterno, pedibus, segmentisque abdominalibus apice fasciis medio-interruptis griseo-pubescentibus;

mandibulis apice ferrugineis; capite thoraceque dense ruguloseque punctatis, abdomine nitido vix punctato; labro duobus tuberculis parvis; alis plerumque hyalinis, sed area apicali fuscohyalina.

Long. 7 mm.

Black; the front, postorbits, pleura, legs, and sternum covered with a griseous pubescence. Mandibles ferruginous at apex. First abdominal tergite covered with griseous pubescence basally and laterally, that on sides excavated to form an apical interrupted fascia, following tergites with interrupted apical fasciæ of similar pubescence; sternites 2 and 3 with continuous fasciæ of griseous pubescence, fourth and fifth with fringe of curled brown hairs ("Wimperhaare," *Friese*).

Head and thorax evenly and rugosely punctured; abdomen shining, very finely punctured.

Third and fourth antennal joints subequal; scutellum prominent, with a strong median depression; axillar teeth robust, well developed.

Wings clear hyaline at base, with apical area fuscohyaline; second abscissa of radius about half the length of first abscissa.

Length 7 mm.

ASSAM: Shillong, April 1903 (*R. E. Turner*). 2 ♂♂.

This species comes very near *E. peregrinus*, Ckll., but differs in the following details:—The markings of griseous pubescence in *E. peregrinus* take the form of "subdorsal spots" on tergites 3–7, in the present species the pubescence is in interrupted fasciæ; the second cubital cell is subtriangular in the former species, in the latter there is a distinct abscissa of the radius; the head and thorax of the former are distinctly *shining*, with the punctures comparatively scattered, in the latter they are dull and very close.

For differences between *E. peregrinus* and *E. fervidus*, Sm., *vide* Ann. & Mag. Nat. Hist. (8) viii. p. 668 (1911).

### *Epeolus tibetanus*, sp. n.

♀. Niger; segmentis abdominalibus fasciis continuis apice griseo-pubeseentibus; mandibulis apice, tibiis tarsisque plerumque ferrugineis; capite thoraceque rugose punctatis, abdomine subnitido; alis hyalinis, parte apicali subfusca; labro integro.

Long. 9 mm.

Black; head and thorax covered with a griseous pile of varying density, thickest on face and pleura. Mandibles at apex, tibiæ and tarsi for the most part, ferruginous. Abdo-

minal tergites 1-5 with continuous apical fasciæ of whitish pubescence, the whole ventral surface of the abdomen clothed with whitish pubescence. Head and thorax coarsely and rugosely punctured; scutellum prominent, with a median depression, the axillæ (lateral teeth) small and acute. Wings hyaline; the apical third subfuscous, stigma and nervures black.

Length 9 mm.

TIBET: Gyangtse (13,000 feet), June 1904 (*H. J. Walton*). Collected on the Tibet Expedition, 1903-4. 5 ♀ ♀.

The host of this species is probably *Colletes sanctus*, Ckll., a long series of which was caught in the same locality at the same time.

The species may be readily recognized by the unbroken abdominal fasciæ and the entire labrum. It would otherwise seem to resemble *E. transitorius*, Eversm., var. *seraxensis*, Rad., from Transcaspia, and *E. fallax*, Mor., from Algeria. In addition to the characters mentioned above, it differs from the former in having the scutellum and tegulæ black.

*Epeolus ventralis*, sp. n.

♂. Niger, albido-tomentosus; facie clypeoque, thoracis lateribus sternoque, mesonoto duabus lineis longitudinalibus, abdominis segmentis fasciis apicalibus, 1 et 2 medio interruptis, 3-6 continuis, albido-tomentosis; segmentis ventralibus 2 et 3 apice albo-, 4-6 brunneo-fasciatis; antennarum articulo 2 infra ferrugineo; alis pallide fuscis; labro integro.

Long.  $10\frac{1}{2}$  mm.

Black, more or less clothed with whitish pubescence. The face and clypeus somewhat thickly clothed, thorax above finely, with two distinct longitudinal lines of pubescence along the anterior margin of disc of mesonotum; postscutellum and median segment laterally clothed with whitish pubescence. Abdomen: tergites 1 and 2 with apical fasciæ interrupted medially (that on tergite 1 bilobed), tergites 3-6 and sternites 2 and 3 with continuous apical fasciæ of whitish pubescence. Sternites 4-6 with an apical fringe of curled brown hairs. Second joint of antennæ beneath ferruginous red. Wings smoky. Stigma and nervures black. Head and thorax coarsely and evenly, abdomen finely punctured. Scutellum divided medially to form two blunt lobes, axillæ small and acute.

Length  $10\frac{1}{2}$  mm.

CHINA: Hsikou, near Tientsin, 17. vi. 06 (*F. M. Thompson*). 1 ♂.



This species superficially resembles *E. tristis*, Eversm., but has the labrum entire, and the apical abdominal fascia on tergite 3 is continuous.

*Epeolus incrassatus*, sp. n.

♂. Niger supra, ferrugineus infra, albo-hirtus; clypeo apice, labro mandibulis, pronoto, pleuris, segmentis ventralibus pedibusque plerumque ferrugineis; capite, thorace (vertice mesonotoque exceptis) pedibusque albo-hirtis; segmentis abdominalibus dorsalibus 1 et 2 apice laterale albo-fasciatis, 3 et 4 maculis albis, segmentis ventralibus plerumque albo-hirtis; alis hyalinis, parte apicali subfusca; labro integro.

Long. 9 mm.

Black, for the most part clothed with white pubescence; clypeus at apex, mandibles, pronotum, pleura, axillæ, legs for the most part, and abdominal sternites ferruginous red. Abdominal tergites 1 and 2 with broad latero-apical fasciæ of white pubescence, very broad at the sides, interrupted medially, fascia on tergite 1 bilobed; tergites 3 and 4 with four ovate white apical spots, and tergites 5 and 6 with two spots; sternites and legs for the most part clothed with fine, short, white pubescence, sternite 4 with an apical fringe of curled fulvous hairs. Tarsi clothed on the inside with golden brown pubescence. Scutellum prominent, with a distinct median depression.

Head and thorax coarsely, abdomen more finely punctured, axillæ sharp, prominent; posterior tarsi very massive, coxæ and femora particularly incrassate. Wings hyaline, apically subfuscous; stigma and nervures black.

Length 9 mm.

SOUTH AFRICA: Basutoland (*R. Crawshay*). 1 ♂.

This species is quite distinct from *E. militaris*, the only South African species known at present with axillar teeth.

*Epeolus fulvohirtus*, Cam.

*Crocisa fulvohirta*, Cam. Trans. S. Afr. Phil. Soc. vol. xv. p. 247 (1905).

I am of opinion that Cameron's species, the type of which is in the British Museum, is an *Epeolus*, and *E. kabrowi*, Brauns, Verh. zool.-bot. Ges. Wien, p. 10 (1909), is probably co-specific.

*Epeolus cameroni*, nom. nov.

*Epeolus bifasciatus*, Cam. Zeitschr. Hym. Dipt. vii. p. 136. (W. Mexico.)

This species needs a new name, since Cresson described an *Ann. & Mag. N. Hist.* Ser. 8. Vol. xii.

*Epeolus bifasciatus* (Proc. Entom. Soc. Philad. iii. p. 38, 1864). More recently Jörgensen used the name yet again for a species from Argentina, and his species has been renamed *E. potrerillensis* by Jensen Haarup.

### NOMADA, Scopoli.

#### *Nomada xanthidica*, Ckll.

*Nomada versicolor*, Smith, Catal. Hymen. Brit. Mus. ii. p. 242 (1854).

♀. (N. China.)

*Nomada japonica*, Smith, Trans. Entom. Soc. Lond. p. 203 (1873). ♀. (Japan.)

A careful examination of the type specimens of these insects has failed to reveal any satisfactory structural character for their separation. The ferruginous markings on the mesonotum of *N. xanthidica*, though absent in the type of *N. japonica*, are present in another specimen from Hiogo, and such colour-markings are often variable. Alfken asserted some time ago that the two species were identical; but Professor Cockerell believed them to be distinct (Trans. Amer. Ent. Soc. xxxi. p. 364, 1905).

Bingham ('Fauna Brit. India,' i. p. 465) considers *N. subpetiolata*, Sm. (1879), from Bombay, to be synonymous with the same author's *N. adusta* (1875). It would seem that the variety he mentions (*l. c.* p. 466) is Smith's *N. subpetiolata*. There can, however, be little doubt they are distinct species. *N. adusta* (type in G. R. J. Rothney Coll.) has the "scutellum, postscutellum, the tubercles, and collar yellow," according to the original description, and there is no mention of the longitudinal mesonotal groove to which Bingham refers in his description of the variety (*l. c.*). *N. subpetiolata* (type in B. M.) has the thorax "ferruginous, with a black longitudinal groove on the mesothorax," and Smith would certainly have mentioned the groove if present in *N. adusta*.

#### *Nomada turneri*, sp. n.

♀. Nigra, capite thoraceque punctatis, corpore nitido; mandibulis clypeo (basi excepto) area faciali infra, scapo, flagello infra (articulo ultimo plerumque), linea postoculari, axillis, tegulis, scutello, postscutello, lineaque mesopleuris, ferrugineis; segmento abdominali secundo fascia basali, segmento quinto omnino ferrugineis, pedibus ferrugineo-variegatis; alis fusco-hyalinis, area apicali fusca.

Long.  $6\frac{1}{2}$  mm.

♀. Black; the mandibles, clypeus (base excepted), the inner orbits below, the scape, flagellum beneath (apical half of terminal joint almost entirely), a line behind the eyes, axillæ, tegulæ, scutellum and postscutellum, and a longitudinal line on mesopleura ferruginous. A broad basal fascia on second tergite, and tergite 5 altogether, ferruginous.

Anterior legs entirely, intermediate and posterior coxæ, trochanters, and tibiæ for the most part, ferruginous.

Head and thorax covered with regular granulose punctures; abdomen shining, impunctate. Enclosed space at base of median segment. Head and thorax with inconspicuous pale tawny pubescence, sides of median segment with a dense patch of white pubescence. Antennæ with a small longitudinal tubercle between their bases. Wings fusco-hyaline, the extreme apical area darker, stigma and nervures black. Third cubital cell much narrowed towards radius, so that the third abscissa of the radius is only half as long as the second.

Length  $6\frac{1}{2}$  mm.

ASSAM: Shillong, v., vii., and viii., 1903 (R. E. Turner); 4 ♀ ♀, 3 ♂ ♂; SIKKIM: Darjeeling, 7000 feet, iii. 1894 (Bingham Coll.); 1 ♀.

♂. Differs only sexually from the female, except that the scape is entirely black; pygidium emarginate at apex.

This species runs out at B. b. b'. in Nurse's key to the Indian species (Ann. & Mag. Nat. Hist. (7) xi. p. 515, 1903), as there are no black species with ferruginous markings included.

### *Nomada wickwari*, sp. n.

♀. Ferruginea, abdomine nigro, maculis flavis variegato; facie thorace sparsim, segmento mediano dense, segmentis abdominalibus 3-6 lateribus, coxis tarsisque albo-hirtis; scutello bilobato, capite thoraceque punctatis, abdomineque nitido; alis hyalinis.

Long. 6 mm.

♀. Ferruginous, the mesosternum and abdomen (except for yellow spots) black; tergite 2 with large, ovate, lateral spots at base; tergites 3 and 4 each with two apical marks, yellow. Face, pleura, coxæ 2 and 3, and median segment with a silvery-white pubescence, densest on the median segment; lateral fasciæ on abdominal segments 3-6 (tergites and sternites) of a similar pubescence.

Head and thorax coarsely and evenly punctured; the scutellum bilobed, shining, with a few scattered punctures;

abdomen shining, impunctate. Joint 3 of antennæ  $1\frac{1}{2}$  times as long as joint 4.

Wings hyaline, faintly fuscous at extreme apical margin; third cubital cell subtriangular, second and third transverso-cubital nervures almost coalescing on the radial nervure.

Length 6 mm.

1 ♀.

CEYLON: Colombo, 1910 (*O. S. Wickwar*).

Collected and presented to the British Museum by Mr. O. S. Wickwar, after whom the species is named.

Through the courtesy of Colonel C. G. Nurse I have been able to examine the type of *Nomada priscilla* from North India, to which species *N. wickwari* is nearly related. Nurse's species, however, is smaller and more slender, with joints 3 and 4 of the antennæ equal; the neuration, too, is different from that of the present species.

*Nomada antennata*, sp. n.

♀. Nigra, thorace ferrugineo; segmento secundo abdominis maculis duabus flavis; capite thoraceque punctatis, abdomine nitido; antennis nigris, elongatis; alis subfuscis.

Long. 6 mm.

♀. Black; thorax and anterior tarsi beneath ferruginous; two ovate basi-lateral spots on tergite 2 and two small indistinct marks on tergite 5 pale yellow. Head and thorax with a sparse pale pubescence.

Metatarsus iii. with short tawny pubescence beneath.

Head and thorax coarsely and evenly punctured; abdomen shining, impunctate. Antennæ of considerable length, joints 3 and 4 subequal. Wings fusco-hyaline, third cubital cell much narrowed above.

Length 6 mm.

1 ♀.

CEYLON: Kandy (*O. S. Wickwar*).

Resembles *N. wickwari* in general facies, but is at once distinguished in having long black antennæ, with joints 3 and 4 subequal, and the head and legs black.

Five species of *Nomada* are now known from widely separated localities in the Æthiopian Region; no specimens appear to have been received from Central Africa as yet.

The following key may help to separate the Æthiopian forms:—



- |    |   |   |
|----|---|---|
| 1. | { Larger species, 12-13 mm. ....  | 2.  |
|    | { Smaller species, 8-9 mm. ....   | 3.  |
| 2. | { Flagellum black above, ferruginous below;<br>abdominal segment 1 ferruginous; ter-<br>gite 2 with a narrow apical fascia, yellow.<br>L. 13 mm. .... | [(Cape Colony.)<br><i>gigas</i> , Friese, ♀.    |
|    | { Antennæ ferruginous, except joints 10-13,<br>which are black; abdominal segment 1<br>black, following segments black and<br>yellow. L. 12 mm. ....  | [(Abyssinia.)<br><i>abyssinica</i> , sp. n., ♂. |
| 3. | { Third joint of antennæ, seen from below,<br>distinctly longer than fourth; first tergite<br>brick-red. L. 8 mm. ....                                | [(Transvaal.)<br><i>kobrowi</i> , Brauns, ♂.    |
|    | { Third joint of antennæ, seen from below,<br>equal to fourth; first tergite black. L.<br>9 mm. ....  | 4.  |
| 4. | { Disc of mesonotum with two longitudinal<br>reddish lines; pleura mostly red, seg-<br>ment 6 red ....  | [(Old Calabar.)<br><i>africana</i> , Friese, ♀. |
|    | { Disc of mesonotum and pleura entirely<br>black; segment 6 yellow ....   | [(Abyssinia.)<br><i>hararensis</i> , sp. n.     |

*Nomada abyssinica*, sp. n.

♂. Nigra, abdomine maculis fasciisque pallide flavis; mandibulis, clypeo apice extremo, antennis (articulis 10-13 exceptis) angulis pronoti, callis humeralibus, tegulis, scutello, pygidioque ferrugineis; pedibus (coxis trochanteribus femoribusque exceptis) ferrugineis, facie, area postoculari, sterno, segmentis ventralibus basalibus albo-, labro, metanoto, tarsis, segmentisque ventralibus apice plus minusve fulvo-hirtis; capite thoraceque rugose punctatis, area excisa metanoti glabra, abdomine minute punctato; alis fusco-hyalinis, area apicali fusca.

Long. 12 mm.

♂. Black; the mandibles, clypeus at extreme apex, antennæ except joints 10-13, lateral angles of pronotum, calli humerales, tegulæ, scutellum and pygidium ferruginous; legs (except coxæ, trochanters, and femora basally) ferruginous; tergites 2 and 3 with large ovate lateral spots, almost touching above, and tergites 4-6 with apical fasciæ, pale yellow. The face, postocellar region, sternum, and basal sternites covered with a white pubescence; labrum, median segment, tarsi, and fasciæ on apical sternites with fulvous pubescence. Head, thorax, and coxæ evenly and distinctly punctured, abdomen and legs more finely, excised space at base of median segment glabrous. Tergite 1 and anterior and intermediate femora shining, practically impunctate.

Wings fusco-hyaline, the apical area darker. Clypeus truncate anteriorly; joint 3 of antennæ rather longer than

joint 4; an indistinct longitudinal tubercle between antennæ at base; calli humerales blunt, prominent. Pygidium with a slight apical emargination.

Length 12 mm.

ABYSSINIA: Harar, 1911 (*Gunnar Kristensen*). Presented by R. E. Turner.

2 ♂♂.

*Nomada hararensis*, sp. n.

♀. Nigra, abdomine maculis fasciisque pallide flavis; mandibulis, labro, clypeo apice, antennis (articulis apicalibus exceptis) angulis pronoti, callis humeralibus, tegulis, post-tegulis, scutello, post-scutello segmentisque ventralibus apicalibus ferrugineis; pedibus (coxis, apice excepto, trochanteribus omnibus femoribusque posticis exceptis) ferrugineis; capite thoraceque sparsim albo-hirtis; capite thoraceque sat rugose, abdomine minute punctatis; area excisa metanoti glabra, inconspicue striata; alis subhyalinis, area apicali fusco-hyalina.

Long. 9 mm.

♀. Black; mandibles, labrum, apex of clypeus, antennæ (except four terminal joints), lateral angles of pronotum, calli humerales, tegulae, post-tegulae, scutellum, post-scutellum, and sternites 5 and 6 ferruginous. Legs (except coxæ basally), trochanters, and basal half of posterior femora ferruginous; tergites 2-4 with ovate lateral spots, tergites 5 and 6 with apical fasciæ, pale yellow. Head and thorax with a sparse whitish pubescence, evenly and distinctly, abdomen very finely punctured, shining, the excised area at base of median segment glabrous, finely striate. Joint 3 of antennæ equal to joint 4.

Wings subhyaline, the apical area fusco-hyaline.

Length 9 mm.

♂. Differs from female in the following respects:—Scape, flagellum above (terminal joints beneath also), clypeus entirely, scutellum, postscutellum and all the femora, intermediate and posterior tibiæ for the most part, black. The males described as the alternate sex were evidently collected with the females, but may possibly be distinct.

ABYSSINIA: Harar, 1911 (*Gunnar Kristensen*). Presented by R. E. Turner.

9 ♀♀, 2 ♂♂.

All Smith's types of American *Nomada* are mentioned by Cockerell (Trans. Am. Ent. Soc. xxxi. p. 310 *et seq.*). In my opinion the genera erected by Robertson (Canad. Ent.

xxxv. p. 174) hardly merit the rank, with the exception of *Gnathias*, which certainly has an excellent distinctive structural character in the bidentate mandibles.

Robertson considers *N. annulata*, Sm., ♂ (nec ♀), to be synonymous with *Nomada* (*Centrias*) *americana*, K. (Trans. Amer. Ent. Soc. xxii. p. 125). The male of Smith's species certainly has the characters of *Centrias* as defined by Robertson (*l. c.*), but there appears to be no reason to doubt that Smith had correctly associated the sexes, and *N. annulata* ♀ is certainly not a *Centrias* as defined (*l. c.*).

*Nomada vinnula*, Cress.

*Nomada vinnula*, Cresson, Trans. Amer. Ent. Soc. vii. p. 202 (1879).  
♀ ♂.

*Nomada interceptor*, Smith, Deser. New Spec. Hymen. p. 100 (1879).  
♂.

Smith's type, from Vancouver, agrees with a male labelled "*N. vinula*" by Cockerell. Cresson's species has priority by a few months. The spelling of the specific names is that employed by the authors respectively, but they appear in literature as "*vinula*" and "*intercepta*."

XV.—*Descriptions and Records of Bees.*—LIII.

By T. D. A. COCKERELL, University of Colorado.

*Megachile heliophila*, sp. n.

♂.—Length about 10 mm., expanse 20.

Black; rather robust, but parallel-sided; head rather large, the cheeks and vertex very broad; clypeus densely and strongly punctured, but shining between the punctures, wholly without any median smooth or raised line, the lower margin slightly undulate, obscurely subemarginate in middle; mandibles broad and stout, the third tooth remote from the second, the apical part not covered with hair; from beneath the lower edge of clypeus, and from lower edge of mandibles, comes bright ferruginous hair, and there is a tuft of long hair of the same colour on the end of the labrum; antennæ entirely black; vertex closely and finely punctured; hair of head and thorax long and loose, mostly white, but brownish on clypeus, black on vertex and disc of mesothorax, and much long black hair mixed with the pale on scutellum; mesothorax and scutellum very minutely

and densely punctured, but the margins of the punctures shining; tegulae black, minutely punctured. Wings dusky; second submarginal cell very long. Legs black, with white hair; middle and hind spurs black, but spurs of anterior tibiae red; anterior femora with the upper side concave in profile. Abdomen closely and finely punctured (not so closely on disc of fourth segment); long erect white hair on first segment and base of second, not hiding the surface; second beyond base, and third and fourth, with short fuscous hair; a white marginal hair-patch on each side of first segment, and white hair-bands, weak in middle, on second and third; greater part of fifth segment, and all of sixth, covered with appressed golden hair; ventral scopa white.

*Hab.* Sunnybank, Queensland, Sept. 12, 1911 (*H. Hacker*). Queensl. Mus., 9.

Rather like *M. remotula*, Ckll., but larger, the clypeus differently formed, the flagellum not red beneath, &c. It may also be compared with *M. oblonga*, Sm., but differs by the dusky wings, the tuft of red hair on labrum, &c.

*Sphecodes thoracicus*, Ashmead.

St. Vincent. I recently examined the type of this species in the U.S. National Museum. It is a slender bee with peculiar coloration and a very large stigma. It appears to represent a distinct genus.

*Halictus auratus*, Ashmead.

St. Vincent. I have examined the type in the U.S. National Museum. The colours resemble those of *Augochlora*, but the inner orbits are as in *Halictus*. The face and front are suffused with copper-red.

*Halictus indistinctus*, Crawford.

Costa Rica. I examined the ♀ type in the U.S. National Museum. The mesothorax is dull, only faintly green, abruptly contrasting with the shining anterior border of scutellum. The area of metathorax has about the basal two-fifths plicatulate.

*Andrena pecosana*, sp. n.

♀.—Length about 12 mm.

Black, with greyish-white hair, dense and lively pale ochreous on vertex and thorax above; head broad; facial foveae broad, filling more than half the space between



antennæ and eyes, seen from above very pale yellowish, not widely separated from eye, extending downwards to about level of top of clypeus; third antennal joint nearly as long as the following three together; disc of clypeus shining, sparsely punctured, marginal parts dullish and more closely and finely punctured; malar space linear; process of labrum strongly bifid; tongue remarkably short; mesothorax microscopically tessellate, dull, with sparse very feeble punctures; area of metathorax triangular, granular; tegulae rufo-testaceous. Wings hyaline, with a very faint brownish tinge, the nervures and small stigma ferruginous; second s.m. broad, receiving first r. n. at middle or beyond. Legs with pale hair, light orange-ferruginous on inner side of basitarsi; small joints of tarsi ferruginous. Abdomen dull, with excessively minute punctures; hind margins of segments with very broad heavy entire ochreous-whitish hair-bands; caudal fringe pale reddish.

*Hab.* Pecos, New Mexico, August 31 (*Cockerell*).

Resembles *A. grænicheri*, Ckll., and *A. mentzeliae*, Ckll., especially the former, from which it differs by the bifid process of labrum and the heavily banded abdomen.

*Hypanthidium panamense*, sp. n.

♀.—Length about  $7\frac{1}{2}$  mm.

Robust; head and thorax black and bright chrome-yellow, with the dorsal pubescence orange-fulvous; abdomen and legs clear ferruginous and yellow, without black; head and thorax above very densely punctured; punctures of mesopleura very large, posteriorly there is a smooth shining impunctate area; head yellow, with the following parts black: occiput and posterior part of cheeks, labrum, large quadrate frontal patch enclosing the ocelli and sending a band on each side to top of eye, having also three bands projecting from its lower border, one to each antenna, and one to middle of supraclypeal area, a spot at each lower corner of supraclypeal area; clypeus entirely yellow, except the ferruginous anterior edge; mandibles broad, with only two small teeth, cutting-edge black, behind this suffusedly reddish, and basal part of mandibles yellow; malar space obsolete; antennæ clear ferruginous, the scape yellow in front; thorax black, with the following parts yellow: large patch occupying nearly all mesopleura, large part of tubercles, rather narrow anterior (except in middle) and lateral borders of mesothorax (but no discal stripes), axillæ and the broad hind margin of the prominent, shallowly emarginate scutellum; base of metathorax with a series of large deep pits; tegulae

ferruginous, darkest in middle. Wings dusky, strongly so in costal region; second r. n. going as far beyond second t.-c. as first beyond first t.-c. Legs red and yellow, with orange-fulvous hair, the yellow on under side of femora and on basitarsi; no pulvilli. Abdomen shining, punctured, the punctures much larger on the basal than apical part of segments; first, third, fourth, and fifth segments with entire yellow bands, second with a yellow patch on each side, apical segment yellow with a ferruginous mark on each side; ventral scopa light fulvous.

*Hab.* Gatun, Canal Zone, Panama (A. H. Jennings). U.S. National Museum.

Nearest to *H. aureocinctum*, Ckll., but mesothorax without discal stripes and abdomen without black. Also related to *H. elegantulum* (Smith), but antennæ and abdomen differently coloured.

*Hypanthidium ecuadorium* (Fries).

♂.—Length about  $8\frac{1}{2}$  mm.

General form and appearance of *H. flavomarginatum* (Sm.); head and thorax black and yellow (a sort of dilute orange); the yellow parts of the head are the clypeus (except fuscous lower edge), a broad supraclypeal band presenting two angulations above (the inner side of each bounding the antennal socket), broad lateral marks ending in a point at level of lower side of anterior ocellus, a band across hind part of vertex and extending halfway down cheeks, and most of outer surface of mandibles; front, vertex, and mesothorax extremely densely punctured; antennæ reddish, the scape yellowish in front near apex and with a large black mark on inner side; flagellum, except basally, strongly suffused with dusky; sides of metathorax with a narrow yellow band which curves around in front, but is very broadly interrupted in middle; axillæ and scutellum (except a broad basal triangle) yellow; metathorax with rather small, irregular basal pits, and a large smooth excavated space on each side; tubercles largely yellow; pleura black; tegulæ large, light ferruginous. Wings fuliginous, especially in costal region; second r. n. going as far beyond second t.-c. as first beyond first t.-c. Legs variegated, blackened basally, the femora with a red streak above, and the anterior and middle ones with a shorter apical yellowish streak behind; tibiæ reddish and blackish, the hind ones darkest; tarsi dark, with white hair on outer side, anterior tarsi with a long silky white fringe behind. Abdomen shining and quite sparsely punctured, black, the hind margins of the

segments broadly dark reddish brown; yellow markings on abdomen as follows: on first segment a pair of very large pyriform patches, pointing mesad, and not reaching subdorsal region, on third to sixth a broad entire band; apical segment broadly rounded, black with a submarginal yellow band, outside of which the margin is translucent; disc of seventh segment subcarinate, shining, with large sparse punctures.

♀.—Similar to the male, except as follows: mandibles entirely black; clypeus black, except the narrowly yellow upper lateral margins; a yellow dot on supraclypeal area; lateral face-marks ending obtusely above, and below squarely truncate at about level of upper end of clypeus; femora without a yellow mark behind; ventral scopa white.

*Hab.* Guayaquil, Ecuador (*v. Buchwald*). Alfken collection, 10.

Very similar to *H. flavomarginatum*, but the face-markings of the male are quite different, and there is no pit on the seventh abdominal segments. This does seem to agree quite perfectly with Friese's too brief account of his *Anthidium flavomarginatum*, var. *ecuadorium*, but his specimens were taken by the same collector at the same place and are doubtless conspecific.

*Dianthidium macrurum*, sp. n.

♂.—Length 15 mm. or rather more, if the abdomen were held straight; anterior wing  $10\frac{1}{2}$  mm.

Red and yellow, with little black; head and thorax extremely densely punctured above, the mesothorax dull, but the pleura with larger, separated (though close) punctures, the surface between them shining; hair of head and thorax fulvous dorsally, paler beneath, pale around the very strongly keeled tubercles; vertex, cheeks, and sides of front rather narrowly ferruginous; front except sides black, this enclosing ocelli; area between antennae red, but a black band below antennae, but the lower part of the supraclypeal area red; clypeus and sides of face yellow, the upper half of the clypeus suffusedly reddened; mandibles yellow with the apex and cutting-edge black, only two well-formed teeth; labrum black; antennae red, with the apical half or more of flagellum black; thorax red, the scutellum very bright, a good deal of black in region between metathorax and mesopleura, and metathorax narrowly black at sides of base; tegulae large, red, closely and finely punctured. Wings dark reddish fuliginous; second r. n. going well beyond second

s.m. Legs bright ferruginous red, with the hind basitarsi yellow, and the others suffusedly more or less yellowish; pulvilli distinct. Abdomen rather long, tapering, red, with an angular yellow patch on each side of second segment, the third to fifth segments nearly all yellow except in middle and on extreme lateral margins, and a transverse red patch or band on the middle of the yellow on each side; seventh dorsal segment obtusely angular at sides, and in middle produced into a very long bent finger-like process, the upper side of which is keeled; second ventral segment raised and angulate in middle of apical margin.

*Hab.* Federal District, Mexico (*J. R. Inda*, 21). U.S. National Museum.

A very distinct and remarkable species, kindly placed in my hands for description by Mr. J. C. Crawford. I know of no close relative; on account of the structure of the seventh abdominal segment it forms a section by itself.

*Dianthidium bivittatum* (Cresson).

Cresson described this in 1878 from two males collected in Mexico. The female, hitherto unknown, has been found at Livingston, Guatemala, May 11, by Messrs. Barber and Schwarz. It is like the male, but has the following special characters: clypeus black, its lower margin bidentate; hair of vertex and mesothorax all ochreous; mandibles massive, with a very long and oblique quadridentate inner edge, a large yellow spot on outer surface near base; yellow face-marks consisting of two bars, divergent above, between antennæ, and narrow stripes along the whole length of the inner orbits; yellow stripe of cheeks and occiput interrupted at level of top of eyes, and again (broadly) in middle; middle femora with a yellow band beneath and hind ones with a spot near apex; first two abdominal segments black with shining pile, the others mainly orange, the sixth broadly black apically; ventral scopa thin and short, glittering pure white. *D. nectarinioides* (Schrottky) is an allied South American species.

These insects curiously resemble certain Eumenid wasps.

*Dianthidium (Anthidiellam) eiseni*, sp. n.

♂.—Like *D. notatum* (Latr.), but the markings cream-colour; femora black with the knees reddish; dark parts of tibiæ reddish black, but anterior tibiæ light ferruginous in front; lateral face-marks hardly going above level of antennæ;



supraclypeal area with only the lower corners pale ; axillæ black ; wings clear hyaline basally ; band on second abdominal segment (narrowly interrupted in middle) more slender.

*Hab.* San José del Cabo, Lower California. U.S. National Museum.

This is evidently from the same lot as those recorded by Fox, Proc. Calif. Acad. Sci. ser. 2, vol. v. p. 270, as a variety of *D. notatum*. A relative in California is *D. robertsoni*, Ckll., but that has differently formed and coloured markings.

*Anthidium 22-punctatum*, Friese.

♂ ♀. Guayaquil, Ecuador (*v. Buchwald*). Alfken collection, 9.

Friese's measurements are too small, unless applied to specimens with the abdomen contracted and turned downward. In my female the outer spots on the fifth abdominal segment are mere dots. The species belongs to *Anthidium*, s. str., and closely resembles various North-American species, from which it is readily known by the 5-dentate apex of male abdomen.

*Agapostemon nasutus*, Smith.

4 ♂. Guayaquil, Ecuador (*v. Buchwald*). Alfken collection, 13. These are quite typical.

*Centris nigerrima* (Spinola).

Chile. *Anthophora dimidiata*, Smith, is a synonym, as shown by a specimen in my possession, from F. Smith's collection.

*Centris euphenax*, sp. n.

♀.—Length about 15 mm.

Robust ; head, thorax, and legs black ; abdomen with the first three segments black with a very obscure bluish tint, the hind margin of the third reddish ; remaining abdominal segments bright ferruginous red ; clypeus shining, sparsely punctured at sides, cream-coloured except the broad lateral and upper margins (the cream-coloured area coming to a point above) and the linear brown lower edge ; labrum cream-coloured except the narrow lateral and apical margins. its hair black ; eyes moderately converging above ; hair of whole insect entirely black, except on the red (apical) part

of the abdomen, where it is clear red. Wings rather dilute fuliginous, violaceous.

*Hab.* Pachacayo, Peru, over 12,000 ft., March 27 (*C. H. T. Townsend*).

A species of the same general type as *C. hæmorrhoidalis* (Fab.), but more robust, with the wings darker and the abdomen less blue. Superficially, it is exactly like the workers of *Bombus coccineus*, Friese, which were taken by Professor Townsend at the same time and place.

*Bombus rufocinctus albertensis* (Cockerell).

The following notes, additional to the original description, are taken from the type. Pile coarse, rather long, on abdomen much shorter than in *B. kirbyellus*; ocelli about as in *rufocinctus*, as also the deep sulcus in front of middle ocellus; corbicular fringe pure black; spinules of tarsal joints red; black interalar band eye-shaped, narrowing laterally. The following measurements are in microns:—antero-posterior diameter of middle ocellus 357; transverse diameter of a lateral ocellus 323; lateral ocellus distant from eye 595; middle ocellus to lateral ocellus 221; length of third antennal joint 595, of fourth 323, of fifth 357.

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XVI.—*Description of a new Species of Agouti* (Myoprocta).

By R. I. POCKOCK, F.R.S.

*Myoprocta pratti*, sp. n.

General colour of upperside olive-green, owing to the pale yellow annulation of the black hairs. Dorsally the pale annuli are narrower than laterally, making the sides of the body lighter than the back. Ventrally the yellow annuli prevail over the black, so that the sides of the belly are pale yellow. Along the middle line of the belly there is a narrow but rather ill-defined white area, which spreads slightly between the hind legs and markedly between the fore legs on the chest, where it is set off both on the throat anteriorly and on the inner side of the limbs by bright nearly orange-yellow hairs. The anterior part of the throat behind the interrampal area whitish, but the sides of the neck and the cheek covered with hairs banded with black and bright yellow. The top of the head, and especially the muzzle,

brighter coloured than the back. A bright yellow streak behind each ear and a conspicuous bright yellow stripe running internally down the front of the thigh to the hock. Anterior surface of legs covered to the digits with hairs speckled yellow and black.

*Loc.* Peru.

One specimen (type) presented to the Zoological Society by Mr. B. Chavez, who brought it from the "Amazons." A second procured by Mr. A. E. Pratt on the Matana River, Peru.

In *Myoprocta acouchy*, Linn., from Guiana, the hairs are speckled with rich rusty yellow, and many of those on the hind-quarters are wholly black, the underside is rusty orange all over, and the fronts of the legs are almost the same colour as the belly and unspeckled.

## XVII.—*The Classification of the Percoid Fishes.*

By C. TATE REGAN, M.A.

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THE large and varied order Percomorphi occupies a central position among the Teleostean fishes. On the one hand it appears to be derived from the Berycomorphi, and on the other it seems to have given rise to a number of specialized offshoots, which may be regarded as ordinally distinct: Scleroparci, Heterosomata, Plectognathi, Discoccephali, Xenopterygii, Pediculati, Symbranchii, and Opisthomi.

The Percomorphi may be thus defined :—

"Symmetrical acanthopterous physoclists with normal dorsal fin, pelvic fins never more than 6-rayed, subabdominal, thoracic, jugular, or mental in position, the pelvic bones typically attached to the cleithra; principal caudal rays not more than 17. No orbitosphenoid. Second sub-orbital not forming a stay for the præoperculum. Post-temporal more or less distinctly forked."

At present I am inclined to recognize thirteen suborders, viz. *Percoidæ*, *Trichiuroidæ*, *Scombroidæ*, *Siganoidæ*, *Tenuthidoidæ*, *Kurtoidæ*, *Gobioidæ*, *Blennioidæ*, *Strumatooidæ*, *Anabantoidæ*, *Mugiloidæ*, *Polynemoidæ*. But it is largely a matter of opinion whether some of these may not be regarded as ordinally distinct, or whether others should not rank merely as divisions of the *Percoidæ*.

I have already dealt with the *Trichiuroidæ*, *Scombroidæ*,

Gobioidea, and Blennioidea, and have given some account of the Anabantoidea and Stromateoidea, whilst Starks has described the osteology of the Mugiloidea.

The present paper deals mainly with the Percoidea, the most generalized suborder, defined by the absence of the special peculiarities which characterize the other suborders of the Percomorphi.

The limits and contents of the Percoidea are indicated in the following scheme :—

#### Suborder PERCOIDEA.

1. *Perciformes*: Serranidæ, Pseudoplesiopidæ, Plesiopidæ, Kuhlidæ, Centrarchidæ, Priacanthidæ, Chilodipteridæ, Percidæ, Sillaginidæ, Latilidæ, Lactariidæ, Bathyclupeidæ, Labracoglossidæ, Pomatomidæ, Rha-chicentridæ, Carangidæ, Menidæ, Bramidæ, Coryphænidæ, Centropomidæ, Arripididæ, Erythrichthyidæ, Lutianidæ, Nemipteridæ, Lobotidæ, Liognathidæ, Pomadasidæ, Scænidæ, Mullidæ, Lethrinidæ, Sparidæ, Mænidæ, Monodactylidæ, Pempheridæ, Toxotidæ, Scorpididæ, Cyphosidæ, Girellidæ, Ephippidæ, Drepanidæ, Chætodontidæ, Scatophagidæ, Enoplosidæ, Histiopteridæ, Pristolepidæ, Nandidæ, Cichlidæ, Hoplegnathidæ, Cepolidæ.
2. *Cirrhitiformes*: Cirrhitidæ, Chironemidæ, Haplodactylidæ, Chilodactylidæ, Latrididæ.
3. *Pomacentriformes*: Pomacentridæ.
4. *Labriformes*: Labridæ, Odacidæ, Scaridæ.
5. *Embiotociformes*: Embiotocidæ.
6. *Gadopsiformes*: Gadopsidæ.
7. *Trichodontiformes*: Trichodontidæ.
8. *Ammodytiformes*: Ammodytidæ.
9. *Champsodontiformes*: Champsodontidæ.
10. *Trachiniformes*: Opisthognathidæ, Bathymasteridæ, Pinguipedidæ, Chimarrichthyidæ, Trachinidæ, Percophiidæ, Bembropsidæ, Hemerocætidæ, Trichonotidæ, Creediidæ, Linnichthyidæ, Leptoscopidæ, Uranoscopidæ.
11. *Nototheniiformes*: Bovichthyidæ, Nototheniidæ, Bathydraconidæ, Chænichthyidæ.
12. *Callionymiformes*: Callionymidæ, Draconettidæ.



## Division 1. PERCIFORMES.

Spinous dorsal fin usually well developed. Pelvic fins usually thoracic, of a spine and 4 or 5 soft rays; pelvic bones directly attached to cleithra. Mouth typically protractile, the premaxillaries with more or less developed pedicels, and nearly always free from the maxillaries. Hyopalatine and opercular series of bones all present. Lower pharyngeals not ankylosed. Parietals present, separated by supraoccipital; opisthotic well developed; a basisphenoid usually present. Post-temporal forked; pectoral radials hourglass-shaped, four in number, the lowest and sometimes part of the next on the hypocoracoid.

In the following arrangement a few of the more aberrant families are placed last, and the remainder are grouped into those without (Serranidae to Coryphenidae) and those with a scaly process in the axil of the pelvic fins.

## Fam. 1. Serranidae.

Spinous dorsal usually well developed; anal spines usually 3; caudal usually with 17 principal rays, 15 branched (15, 13 branched, in *Anthias*); pelvics thoracic, each of a spine and 5 branched rays, without axillary process. Two nostrils on each side. Gill-membranes free from the isthmus: 5 to 8 branchiostegals; 4 gills; pseudobranchiae usually present. Mouth protractile; villiform or cardiform teeth in the jaws and usually on the palate; each premaxillary ramus with a posterior process or expansion internal to the maxillary; latter broadest distally, usually exposed, rarely sheathed by the præorbital. A subocular shelf. Two postcleithra on each side. Vertebrae 24 or more; first 2 or more præcaudals without parapophyses; some or all of the ribs inserted on parapophyses.

It may be noted that in *Callanthias* and *Therapon* all the ribs are inserted on parapophyses\*, and that those of the genus *Morone* are rather exceptional in their insertion. In this genus the vertebrae number 25, the præcaudals with parapophyses from the third or fourth; of the 10 pairs of ribs the last 3 to 5 (according to the species) are distinctly inserted on the parapophyses, but it is rather a matter of personal opinion as to how many of the remainder are sessile; they may be described either as inserted on the centra below and behind the parapophyses, or as on the

\* Thus forming an exception to the statement made on p. 653 of the 'Cambridge Natural History, Fishes.'

bases of the parapophyses at their origin from the centra. Practically the same structure is seen in *Kuhlia*.

To the Serranidæ I would add *Acropoma*, which has a subocular shelf, *Malacichthys*, probably related to *Acropoma*, and *Dæderleinia* (*Anthias berycoides*, Hilgend.). Two fine examples of this species are in the British Museum Collection, and a skeleton has been made of one of them; the fish is typically Serranid. *Diploprion*, with 2 anal spines, and *Hapalogenys*, with toothless palate, are typical Serranids in other characters. *Therapon*, placed by Boulenger in the Lutianidæ, has no pelvic axillary process.

The Pseudochromididæ do not seem to me deserving of family rank. Except for the 2 lateral lines they are typical Serranidæ, and *Pseudogramma*, with the spinous and soft-rayed portions of the dorsal fin subequal, connects *Gramma* with *Pseudochromis* and *Cichlops*.

### Fam. 2. Pseudoplesiopidæ.

The aberrant genus *Pseudoplesiops* differs from the Pseudochromidinae in that the lower lateral line is absent, the dorsal and anal have but a single spine each, and the articulated rays of the pelvic fins are unbranched, 4 in number.

### Fam. 3. Plesiopidæ.

General characters of the Serranidæ, but the pelvic rays reduced in number, I 2-4, the first soft ray simply bifid.

The genera may be arranged thus:—

I. Pelvics I 4, below or slightly in advance of the pectorals; anal spines 3. A subocular shelf. Two lateral lines.

First soft ray of pelvic not thickened or produced ..... *Trachinops*.

First soft ray of pelvic thickened and produced;  
third and fourth small and slender ..... *Plesiops*, *Paraplesiops*.

II. Pelvics I 2, well in advance of the pectorals, the first soft ray thickened and produced; anal spines numerous. No subocular shelf.

Scales large; one lateral line ..... *Acanthoplesiops*.

Scales small; 3 or 4 lateral lines ..... *Acanthoclinus*.

### Fam. 4. Kuhliidæ.

*Kuhlia* differs from the Centrarchidæ in the presence of pseudobranchiæ, the absence of parietal crests, and the different insertion of the ribs. Vertebrae 25 (10+15); præcaudals with parapophyses from the third or fourth;

first 4 or 5 ribs sessile, inserted below and behind the parapophyses; last 3 or 4 on the parapophyses.

In the structure of the vertebral column and the attachment of the ribs *Kuhlia* shows far more resemblance to *Morone* than to the Centrarchidæ. Other characters confirm its relationship to *Morone*, and make it probable that it is derived from Serranidæ of the type of that genus.

#### Fam. 5. Centrarchidæ.

After the removal of *Kuhlia* this is a very natural and well-defined family, closely related to the Serranidæ, but distinguished by the vestigial or absent pseudobranchiæ, the absence of a subocular shelf, and the different attachment of the ribs. Vertebrae 25 to 33; præcaudals with transverse processes from the third or fourth; ribs mostly sessile, inserted high up on the centra or on the bases of the neural arches, above and behind the parapophyses.

#### Fam. 6. Priacanthidæ.

Differ from the Serranidæ especially in the reduced number of vertebrae, 23 (10 + 13), the first very short and firmly adherent to the skull, the absence of a basisphenoid, and the single posteleithrum. Caudal with 16 principal rays, 14 branched.

#### Fam. 7. Chilodipteridæ.

This family includes fishes with the general characters of the Serranidæ, but with only 2 anal spines. A separate spinous dorsal of 5 to 9 spines. Jaws with villiform teeth, sometimes with canines; teeth on vomer and palatines. An occipital crest; parietal crests feeble or absent. Vertebrae 24 to 27 (10-11 + 14-17); præcaudals with parapophyses from the fifth or sixth; first 3 or 4 ribs sessile.

Principal genera: *Apogon*, *Apogonichthys*, *Chilodipterus*, *Epigonus*, *Synagrops* (*Parascombrops*, *Melanostoma*), *Dinolestes*.

A subocular shelf is present in *Chilodipterus* and many species of *Apogon*, but not in *Apogon marinus* or in *Epigonus*; *Synagrops*, which is the nearest to *Dinolestes* in the dentition, the scaly fins, &c., has a rather feeble shelf, but *Dinolestes* has none.

A good account of the osteology of *Dinolestes* has been given by Starks (Proc. U.S. Nat. Mus. xxii. 1899, pp. 113-120, pls. viii.-xi.).

Fam. 8. *Percidæ*.

Especially distinguished from the Serranidæ by the absence of a subocular shelf and by having only 1 or 2 anal spines. Vertebrae 30 to 48.

In some species of *Percina* and *Etheostoma* I find the principal caudal rays number 17 (1/15/1); in others belonging to *Boleosoma* and *Ammocrypta* there are 16 (1/14/1). I have not fully investigated this, but the character will probably be found of some taxonomic value.

Fam. 9. *Latilidæ*.

Dorsal continuous, with the spinous portion much less extended than the soft or than the anal; latter with 1 or 2 spines; caudal of 17 principal rays, 15 branched; pelvies thoracic, each of a spine and 5 soft rays, without scaly axillary process. Mouth terminal, protractile; villiform teeth in the jaws; often a canine near the distal end of the præmaxillary; palate toothless; posterior expansions of præmaxillary rami reduced; maxillary exposed distally, without supramaxillary, with a proximal posterior expansion more or less developed. A subocular shelf. Gill-membranes united, but free from the isthmus; 6 branchiostegals; 4 gills; pseudobranchiæ present; lateral line complete, continuous. Occipital and parietal crests present, variously developed. Vertebrae 24 to 27 (10-12 + 14-15); præcaudals with parapophyses from the first or third; all the ribs on parapophyses.

Fam. 10. *Sillaginidæ*.

Spinous dorsal separate, of slender spines, less extended than the soft dorsal or anal; later with 2 spines. Teeth on the vomer; jaws normally formed; maxillary concealed beneath the expanded præorbital. Vertebrae 33 (15 + 18); præcaudals with parapophyses from the third; all the ribs on parapophyses. In all other characters essentially similar to the Latilidæ.

Fam. 11. *Lactariidæ*.

*Lactarius* has the general characters of the Serranidæ, but there is no subocular shelf, the spinous dorsal is short, separate, of slender spines, and the soft dorsal and anal are long, covered with small scales. Mouth terminal, oblique, with the lower jaw prominent; maxillary exposed, with



supramaxillary; jaws with small pointed teeth and anterior canines; teeth on vomer and palatines. Upper surface of head with large muciferous cavities, bordered by the parietal crests, which are continued forward to the anterior extremity of the frontals. Vertebrae 24 (10 + 14): last 5 præcaudals with downwardly directed parapophyses; 4 ribs sessile, 4 on parapophyses.

#### Fam. 12. Bathyclupeidæ.

*Bathyclupea*, sometimes associated with *Pempheris*, differs from it externally in that the dorsal fin lacks spines and there is but a single anal spine, as well as in the presence of a supramaxillary; the skeleton differs in that the hypocoracoids are narrowed forward below and the vertebrae number 31 (10 + 21). It seems probable that *Bathyclupea* is related to *Lactarius*, from which it differs especially in the absence of the spinous dorsal fin and the presence of a subocular shelf.

#### Fam. 13. Labracoglossidæ.

The genera *Labracoglossa* (*Cypselichthys*), *Bathystethus* (*Platystethus*), and *Eristius* have the fins formed as in *Lactarius*, except that the dorsal is continuous. Mouth terminal, oblique, with the lower jaw included; maxillary exposed, without supramaxillary; minute teeth in the jaws, without canines; palate with or without teeth. No large muciferous cavities on the head, the parietal crests, if developed, commencing behind the orbit, not extending forward in advance of the insertion of the trunk-muscles. No subocular shelf.

I have examined spirit-specimens, and, judging by the distance between the ribs, I estimate that the vertebrae number 24 in all 3 genera.

#### Fam. 14. Pomatomidæ.

Scarcely distinct from the Serranidæ, but the separate spinous dorsal of a few slender spines, and the first anal spine very small, often overgrown. Præoperculum with a membranous flap produced over the suboperculum. Vertebrae 26 (10-11 + 15-16); præcaudals with downwardly directed parapophyses from the sixth; first four ribs sessile; rest attached near the extremities of the parapophyses.

In *Pomatomus* (*Temnodon*) and *Scoræobrops* (incl. *Tele-scopias*) scales are present, the soft dorsal and anal are

densely scaly, the jaws have a series of strong pointed teeth, with a few inner teeth anteriorly in the upper, smaller teeth are present on the vomer and palatines, a supramaxillary is present and is rather abnormal in form, having a well-marked projection superiorly. *Gymnapogon* (Regan, Ann. & Mag. N. H. (7) xv. 1905, p. 19) is near *Scombrops*, but there are no scales and the supramaxillary is absent.

#### Fam. 15. *Rhachicentridæ* \*.

The spinous dorsal of a few short free spines and the long soft dorsal and anal distinguish *Rhachicentrum* from the Serranidæ; the skull is depressed, flattish above, with the exoccipital condyles wide apart, and there is no subocular shelf; otherwise the skeleton is Serranid.

#### Fam. 16. *Carangidæ*.

Differ from the Serranidæ in the shorter spinous dorsal, with the spines slender or short, the longer soft dorsal and anal, the detachment of the two first anal spines from the rest of the fin, the more widely forked caudal, with the bases of the rays embracing the hypurals to a greater extent, and the more slender caudal peduncle. Head-skeleton and pectoral arch as in the Serranidæ. Vertebrae usually 24 (10+14) (10+15 in *Naucrates*, 10+16 in *Scombroides*, 10+17 in *Paropsis*). In *Seriola*, *Caranx*, and their allies, the anterior ribs are sessile and most of the ribs are inserted on parapophyses when these are developed, but in *Trachynotus*, *Lichia*, *Paropsis*, *Scombroides*, &c., parapophyses are developed from the third or fourth vertebra, but the ribs, except the last two pairs, are sessile.

#### Fam. 17. *Menidæ*.

The very aberrant *Mene* may perhaps be related to the Carangidæ, from which it differs externally in the absence of dorsal and anal spines. The inner apophyses of the maxillaries are compressed into vertical laminae, with their lower edges articulating in a pair of parallel grooves separated by a median ridge on the antero-superior surface of the vomer; a similar arrangement occurs in the Carangid *Micropteryx*. There is a strong occipital crest; the post-orbital part of the skull is elevated and the epiotics meet behind the supraoccipital. There are 23 vertebrae (9+14);

\* Cf. Regan, Ann. & Mag. Nat. Hist. (8) iii. 1909, p. 68.

the enlarged first pair of ribs articulate with the post-cleithra, are sessile on the third vertebra, and are supported by the strong parapophyses of the fourth and fifth vertebrae; the other ribs are inserted on parapophyses.

#### Fam. 18. Bramidæ.

Dorsal and anal fins long, without true spines, but with a few of the anterior graduated rays non-articulated; caudal fin as in the Carangidæ; scales large. Skull with parallel occipital and parietal crests extending to the anterior edge of the frontals as in typical Carangidæ, but the former very high and with the edge nearly vertical anteriorly; mesethmoid hollowed out for the vertical præmaxillary pedicels; no subocular shelf. Vertebrae 42 to 47; most of the ribs at the extremities of closed hæmal arches.

Some species of *Seriola* approximate very closely to *Brama* in cranial structure.

#### Fam. 19. Coryphænidæ.

Differ from the Bramidæ in the small scales and in the structure of the vertebral column; 30 to 33 vertebrae, the præcaudals without parapophyses, the ribs and epipleurals inserted together on the centra.

#### Fam. 20. Centropomidæ.

Closely related to the Serranidæ and Lutianidæ. Spinous and soft portions of the dorsal separate or united, subequal, the former of 7 to 9 strong spines; anal as long as or a little shorter than soft dorsal, with 3 spines; pelvic with a scaly axillary process. Mouth moderately protractile; teeth acute or obtuse, in jaws and on vomer and palatines; maxillary exposed. Subocular shelf broadest posteriorly. Lateral line extending on caudal fin. Vertebrae 24 or 25 (10-12 + 13-15); anterior præcaudals without parapophyses; first 3 to 5 ribs sessile.

The genera may be arranged thus:—

- I. Parietal and occipital crests; operculum ending in a spine; a supramaxillary; a continuous dorsal fin; 25 vertebrae.

*Glaucosoma*, *Psammoperca*, *Lates*.

- II. An occipital, but no parietal crests; frontals with strongly developed muciferous channels; operculum without spine; præoperculum with a double ridge; 24 vertebrae.

A. Dorsals separate; a supramaxillary . . . . *Centropomus*.

B. Dorsals connected; no supramaxillary . . *Ambassis*.

Fam. 21. *Arripididæ*.

*Arripis* scarcely deserves to be placed in a distinct family from *Glaucosoma*, which it resembles in the structure of the mouth, the dentition, the presence of a pelvic axillary process, &c. The spinous portion of the dorsal fin, of 9 slender spines, is much shorter than the extended soft-rayed part, which is considerably longer than the anal. The lateral line ends or becomes indistinct at the base of the caudal fin. Occipital crest short and parietal crests very small: vertebræ 25 (10 + 15): first 5 without parapophyses: first 3 ribs sessile.

The absence of large muciferous channels on the frontals, the broad subocular shelf, the maxillary exposed as in typical Serranidæ and bearing a supramaxillary, the vomerine and palatine teeth, and the 3 anal spines distinguish this genus from the Scianidæ, to which it is only remotely related.

Fam. 22. *Erythrichthyidæ*.

Mouth toothless, strongly protractile; premaxillaries normally formed, their pedicels reaching an interorbital depression of the frontals; maxillary very broad, with a well-developed supramaxillary which slips under the præorbital. In other characters essentially Lutianid; vertebræ 24 (10 + 14); first rib sessile, next 4 or 5 on very short parapophyses, last 2 or 3 on well-developed parapophyses.

A single genus, *Erythrichthys*, rather similar to *Arripis* in cranial osteology.

Fam. 23. *Lutianidæ*.

Spinous dorsal well developed: soft dorsal not much longer than anal; 3 anal spines: caudal with 17 principal rays, 15 branched; pelvis thoracic, each of a spine and 5 branched rays, with a scaly axillary process. Two nostrils on each side. Gill-membranes free from the isthmus; 5 to 7 branchiostegals; 4 gills; pseudobranchiæ present. Mouth protractile; villiform or obtusely conical teeth in the jaws and often on vomer and palatines; each premaxillary ramus with a posterior process or expansion internal to the maxillary; each maxillary ramus broadest distally, not overlapped externally by the extremity of the premaxillary, slipping under the præorbital and first suborbital for at least the greater part of the length of its upper edge. Outer face of palatine flattish or concave, without distinct ridge. A



strong subocular shelf. Occipital and parietal crests developed. Vertebrae always 24 (10+14); first 2 to 6 without parapophyses; first 1 to 4 ribs sessile.

Principal genera: *Lutianus*, *Gerygone*, *Hoplopagrus*, *Aspitus*, *Chaetopterus*, *Odontonectes*, *Cesio*, *Aphareus*, *Aprion*, *Propoma*, *Etelis*, *Verilus*.

#### Fam. 24. Nemipteridæ.

Dorsal X 9. Anal III 7-8. Palate toothless; maxillary ramus as broad just below its palatine articulation as it is distally; outer face of palatine with a strong ridge from the base of the maxillary process to the pterygoid. Vertebrae 24 (10+14); all the præcaudals with parapophyses and all the ribs on parapophyses. In other characters essentially similar to the Lutianidæ.

Principal genera: *Heterognathodon*, *Nemipterus*, *Scolopsis*.

#### Fam. 25. Lobotidæ.

Closely allied to the Lutianidæ, but with the palate toothless and with no subocular shelf.

Two genera, *Lobotes* and *Datnioides*; in both the maxillary is sheathed throughout its length and the scaly axillary process of the pelvic fin is developed. The occipital crest does not extend forward on to the frontals, but is elevated and has the anterior edge thickened; the parietal crests are weak. Vertebrae 24 (10+14 in *Datnioides*, 12+12 in *Lobotes*); in *Datnioides* the first 6 præcaudals without parapophyses, the first 4 ribs sessile, the last 4 on parapophyses; in *Lobotes* the first 5 præcaudals without parapophyses, the first 4 or 5 ribs sessile, the last 5 or 6 on parapophyses. In *Datnioides* the præmaxillary pedicels are long and extend to above the posterior margin of the orbit; they lie in a depression of the frontals; in *Lobotes* they are of moderate length and do not reach the frontals.

#### Fam. 26. Liognathidæ.

Closely related to the Lutianidæ. Dorsal fin depressible in a sheath, with 9 or 10 spines, the first short, the second the longest; soft rays subequal; 2 to 5 anal spines. Pelvics with large axillary processes. Mouth very protractile, the long præmaxillary pedicels lying in a groove or chamber formed by the bifurcation of the occipital crest; maxillary variable in form, but always with the anterior edge curved

more or less in the shape of an S; distal extremity exposed; no supramaxillary; palate toothless. Vertebrae 24 (10 + 14); first 3 without parapophyses; first rib sessile, rest on parapophyses.

In *Gerres*, *Eucinostomus*, &c., there are 10 soft rays in the dorsal fin and the second suborbital emits a triangular internal lamina; in *Pentaprion*, *Liognathus*, and *Gazza* there are 15 or 16 soft rays in the dorsal fin, the suborbitals are not or but feebly ossified, and there is no subocular shelf. The two last-named genera differ from the others in their small scales and in having the gill-membranes attached to the isthmus.

#### Fam. 27. Pomadasidæ.

Closely related to the Lutianidæ, differing especially in the absence of a subocular shelf. Palate toothless, or small teeth on the vomer. Vertebrae 26-27 (10-11 + 16-17), the præcaudals with parapophyses from the third or fourth, the ribs inserted on the parapophyses when these are developed. Outer face of palatine with a ridge along its posterior edge.

Principal genera: *Xenichthys*, *Xenocys*, *Xenistius*, *Parapristipoma*, *Plectorhynchus*, *Boridia*, *Conodon*, *Pomadasis*, *Hæmulon*.

#### Fam. 28. Sciænidæ.

After the exclusion of *Aripis* this is a very natural group, closely related to the Lutianidæ, differing especially in that the soft dorsal is usually more elongate and the anal has only one or two spines; the scaly axillary process of the pelvic fin may be present or absent. The mouth is formed as in the Lutianidæ, the maxillary without a supramaxillary, either concealed or at least slipping under the præorbital and first suborbital for the entire length of its upper edge; the teeth in the jaws are usually villiform, sometimes lanccolate; the palate is toothless. Muciferous channels are well developed on the upper surface of the head; the subocular shelf, when present, is a small and usually slender process of the second suborbital. The vertebrae number 24 to 30; the anterior præcaudals without parapophyses and with sessile ribs, the posterior ribs inserted on parapophyses.

The genera of this very varied family are numerous (cf. Jord. & Everm. Fish N. Am. p. 1392).

Boulenger's definition, that the anal is much shorter than the soft dorsal, does not hold good. *Seriphus*, Ayres, with the anal fin rather longer than the soft dorsal, has the skeleton of a typical Sciænid.

## Fam. 29. Mullidæ.

Spinous dorsal short, of 6 to 8 slender spines, well separated from the short soft dorsal, which is similar to the anal; 1 or 2 anal spines; caudal with 15 principal rays, 13 branched; pelvics thoracic, each of a spine and 5 soft rays, with a scaly axillary process. Two nostrils on each side. Gill-membranes free from the isthmus; 4 branchiostegals; 4 gills; pseudobranchiæ present. A pair of long barbels attached to the hyoid behind the symphysis of the lower jaw. Mouth protractile; villiform teeth in the jaws and often on vomer and palatines; premaxillary rami long, without distinct posterior processes or expansions; maxillary rami usually broadest distally, not overlapped externally by the premaxillaries, sheathed for the greater part of their length. Palatine without ridge. A strong subocular shelf. Occipital and parietal crests developed. Vertebrae 24 (10+14); all the præcaudals with parapophyses and all the ribs on parapophyses.

This family differs from the Lutianidæ in several characters of specialization.

Principal genera: *Mullus*, *Mulloides*, *Upeneus*, *Upeneoides*, *Upeneichthys*.

## Fam. 30. Lethrinidæ.

Closely related to the Lutianidæ. Gill-membranes broadly united, but free from the isthmus. Anterior teeth villiform, with canines; lateral teeth conical or obtuse, in a single series; palate toothless. Premaxillaries with rather long pedicels and short rami, the latter without posterior expansions or processes and with their distal ends internal to the maxillaries. Occipital crest strong; parietal crests strong or moderate. Vertebrae 24 (10+14), all the præcaudals with parapophyses, all the ribs, or all but the first, inserted on the parapophyses.

The three genera may be grouped thus:—

- I. Subocular shelf small, emitted by the second suborbital but mainly internal to the first; maxillary with a very broad posterior expansion below its articulation with the palatine; maxillary process of palatine normal; outer face of palatine with a prominent ridge which extends on to the pterygoid. . . . . *Pentapus*, *Sphærodon*.
- II. Subocular shelf vestigial, a minute process of the second suborbital at its junction with the first; maxillary with a moderately broad posterior expansion, which is overlapped by a flattish downwardly curved branch of the maxillary process of the palatine; outer face of palatine without ridge . . . . . *Lethrinus*.

## Fam. 31. Sparidæ.

Differ from the Lutianidæ especially in that the distal end of the præmaxillary ramus overlaps the maxillary externally. Mouth moderately protractile, the præmaxillary pedicels not or scarcely reaching the frontals; maxillary more or less expanded forward distally, but without distinct notch in its anterior edge; palate toothless. A strong subocular shelf, developed forwards from the second suborbital and mainly internal to the first. Occipital and parietal crests well developed. Vertebrae 24 (10+14).

The principal genera may be arranged thus:—

- I. Præcaudal vertebrae with parapophyses from the third; first rib sessile; teeth conical, with anterior canines.

*Dentex*.

- II. All the præcaudals with parapophyses and all the ribs on parapophyses.

- A. No canines; no transverse series of a few enlarged anterior teeth.

Teeth villiform, in bands, anteriorly acute, laterally conical or obtuse .....

*Pagellus*.

Teeth villiform or cardiform, in bands, the outer series compressed, lanceolate..

*Gymnocrotaphus*, *Cantharus*.

A single series of incisors .....

*Box*, *Scatharus*.

Anteriorly a series of incisors with small obtuse teeth behind them; lateral teeth villiform .....

*Oblata*.

Two series of incisors and within them 2 or 3 series of molars .....

*Crenidens*.

- B. Anteriorly a transverse series of a few enlarged canines or incisors; laterally 2 to 4 series of molars.

*Calamus*, *Stenotomus*, *Sparus*, *Pagrus*, *Diplodus*, *Chrysophrys*.

## Fam. 32. Mænidæ.

Closely related to the Sparidæ. Maxillary with a notch in its anterior edge for the reception of the distal end of the præmaxillary ramus; mouth very protractile, the præmaxillary pedicels extending to the occiput; small pointed teeth in the jaws and sometimes on the vomer. Subocular shelf quite small, developed forwards from the anterior end of the second suborbital. Occipital crest short, rather weak; parietal crests feeble. Vertebrae 24 (10+14); all the præcaudals with parapophyses and all the ribs on parapophyses.

Genera: *Mæna* and *Smaris*.



Fam. 33. *Monodactylidæ*.

This family includes 3 genera with the body deep and strongly compressed, the dorsal and anal long and covered with scales, the former preceded by 5 to 8 graduated spines, the latter by 3, and the pelvic fins small or even vestigial, inserted below the pectorals. Mouth normally formed, terminal, oblique, protractile, with small villiform teeth in the jaws and on the palate; maxillary exposed distally, without supramaxillary. Gill-membranes free from the isthmus. A strong occipital crest extending forward to the anterior margin of the frontals. Vertebrae 24 (10+14); precaudals with parapophyses from the third or fourth; ribs, except the last pair, sessile, inserted behind and above the parapophyses.

The recently described *Bramichthys* (Waite, Rec. Austral. Mus. vi. p. 72, pl. xiv.) differs from *Monodactylus* in the cycloid scales, and in the normally formed pelvic fins with a scaly axillary process. *Monodactylus* has the body ovate or nearly circular and the pelvic fins very small, with a short stout spine and no axillary process; a subocular shelf is present and the pelvic bones are merely coalescent by their inner edges. *Psettus* differs not only in the very deep and abnormally formed body, but in the absence of a subocular shelf and the ankylosis of the pelvic bones.

The Eocene *Amphistium* may belong to this family.

Fam. 34. *Pempheridæ*.

Except for the shortness of the dorsal fin *Pempheris* shows considerable resemblance to the *Monodactylidæ* (especially *Bramichthys*) in external characters. The head-skeleton is very like that of *Monodactylus*, but the pectoral arch differs in the greater expansion of the hypocoracoids. The vertebrae number 24 (10+14), the caudals rather elongate; the anterior ribs are sessile, but the last 5 are inserted on well-developed parapophyses.

Fam. 35. *Toxotidæ*.

Dorsal rather short, above the anal, preceded by 5 strong spines; soft dorsal and anal scaly; pelvic fins well developed, below the pectorals, with scaly axillary process. Mouth rather large, terminal, oblique, protractile, with small villiform teeth in the jaws and on the palate; maxillary very

slender, without supramaxillary. No subocular shelf. Gill-membranes free from the isthmus. Head flattish above, with the occipital crest short and the parietal crests vestigial. Vertebrae 24 (10+14); præcaudals with parapophyses from the third; ribs, except the last pair, sessile, inserted behind and above the parapophyses.

*Toxotes* may be, in my opinion, rather closely related to the Monodactylidæ.

### Fam. 36. Scorpionidæ.

Spinous dorsal well developed; soft dorsal and anal densely scaly; 3 anal spines; pelvies normally developed, with scaly axillary processes, well behind the pectorals, the pelvic bones elongate. Mouth moderately protractile, normally formed; maxillary more or less exposed distally, without supramaxillary; jaws with villiform or slightly compressed and lanceolate teeth in bands; teeth usually present on vomer and palatines. A subocular shelf. Vertebrae 25 (10+15); præcaudals with parapophyses from the third or fifth; ribs, except the last pair, sessile, inserted above and behind the parapophyses.

In *Scorpiis* the vertebrae number 25 (10+15), the præcaudals with parapophyses from the third; the strong occipital and parietal crests end at a transverse ridge which forms the posterior border of the frontals, which are rather strongly elevated posteriorly.

The skeleton of *Medialuna* is precisely similar to that of *Scorpiis*, and the two genera differ only in the dentition and in the form of the spinous dorsal. *Atypichthys* is very near *Medialuna*, but parapophyses commence on the fifth vertebra and the frontals are less elevated posteriorly. *Neatypus* and *Atyposoma* are the remaining genera of this family.

### Fam. 37. Cyphosidæ.

Differs from the preceding especially in the absence of a subocular shelf and in the dentition, the jaws having an outer series of strong incisors implanted by horizontal roots, with a series of small villiform teeth behind them. Vertebrae 26 (10+26); præcaudals with transverse processes from the fourth; ribs, except the last, sessile; first epipleural expanded, laminar.

Genera: *Cyphosus*, *Sectator*, *Hermosilia*.

I have examined the skeleton of *C. boscii*, which is extremely similar to that of *Atypichthys*.

## Fam. 38. Girellidæ.

Probably related to the Scorpidae and Cyphosidae, to which they bear a considerable resemblance. Mouth small; maxillary concealed beneath the præorbital and first sub-orbital; no supramaxillary; jaws with bands of incisors; palate toothless. A subocular shelf. Vertebrae 27 (11 + 16); all the præcaudals with parapophyses and all the ribs inserted on parapophyses.

I have examined the skeleton in *Girella*, *Melambaphes*, and *Doydirodon*, which differ in their osteology from the Scorpidae only in the structure of the vertebral column and the attachment of the ribs. *Proteracanthus* is near *Doydirodon*, but has the gill-membranes broadly joined to the isthmus.

*Tephraops*, *Pachymepoton*, and *Dipterodon* probably pertain to this family.

## Fam. 39. Ephippidæ.

Body deep, compressed. Soft dorsal and anal densely scaly; 3 anal spines; caudal of 17 principal rays, 15 branched. Gill-membranes broadly attached to the isthmus. Mouth small, terminal, not or scarcely protractile; jaws with bands of setiform teeth; palate toothless. An elevated occipital crest; no parietal crests. Vertebrae 24 (10 + 14); præcaudals with parapophyses from the fourth; ribs, except the last 2 pairs, sessile.

*Ephippus* has a distinct spinous dorsal and a broad subocular shelf. *Platax* and *Parapsyttus* have the dorsal spines graduated and the subocular shelf very feeble.

## Fam. 40. Drepanidæ.

In general form, development of the vertical fins, dentition, structure of the skull, and vertebral column, similar to the Ephippidæ. Mouth protractile, with the maxillary exposed distally. No subocular shelf.

## Fam. 41. Scatophagidæ\*.

Body deep, compressed. Spinous dorsal well developed; anal spines 4; caudal of 16 principal rays, 14 branched; pelvic axillary process present. Gill-membranes forming

\* Cf. Gill, Proc. U.S. Nat. Mus. xiii. 1891, p. 355.

a fold across the isthmus, to which they are narrowly attached. Mouth small, terminal, transverse, not protractile; jaws with bands of setiform teeth; palate toothless. An elevated occipital crest; no parietal crests; a subocular shelf. Vertebrae 23 (10+13); last 3 præcaudals with parapophyses; ribs sessile, inserted high up on the centra or on the bases of the neural arches.

#### Fam. 42. *Chætodontidæ*.

Body deep, compressed. Spinous dorsal well developed; soft dorsal and anal densely scaly; anal spines 3 or 4; caudal of 17 principal rays, 15 branched; pelvic axillary process present. Gill-membranes sometimes united, but free from the isthmus, more often narrowly attached to the isthmus. Mouth small, terminal, protractile; jaws with bands of setiform teeth; palate toothless. An elevated occipital crest; no parietal crests; a subocular shelf. Vertebrae 24 (10+14); præcaudals with transverse processes; ribs much expanded proximally, inserted on the transverse processes, with which they form an extended articulation.

Principal genera: *Chætodon*, *Chelmo*, *Heniochus*, *Holacanthus*, *Pomacanthus*.

#### Fam. 43. *Enoplosidæ*.

*Enoplosus* appears to be at least as closely related to the Histiopteridæ as to the Scorpidae. It resembles the Histiopteridæ in the large pelvic fins with long and strong spines placed below or slightly behind the pectorals, the short and broad pelvic bones, the occipital crest with the anterior edge thickened, the absence of parietal crests, &c. Mouth normally formed; maxillary exposed distally, with supra-maxillary; villiform teeth in jaws and on vomer and palatines; præorbital normally attached to lateral ethmoid, forming part of the border of the orbit; a subocular shelf. Vertebrae 26 (10+16); præcaudals with parapophyses from the fifth; ribs, except the last pair, sessile.

#### Fam. 44. *Histiopteridæ*.

Differs from the preceding especially in that the præorbital is displaced forward, not entering the orbit, and in the vertebral column, which comprises 25 vertebrae (13+12), the præcaudals with parapophyses from the fourth or fifth,



the ribs inserted on the parapophyses. There is no supramaxillary and the external bones of the head are rugose, uncovered by skin.

Jordan (Proc. U.S. Nat. Mus. xxxii. 1907, p. 235) details the external characters of the family and gives a synopsis of the genera. I have examined the skeleton in *Histioglossus* and *Pentaceropsis*.

#### Fam. 45. *Pristolepidæ*.

Mouth small, moderately protractile, the præmaxillary pedicels not reaching the frontals. Jaws formed as in the Lutianidæ, with villiform teeth; teeth on vomer, palatines, and parasphenoid. Pseudobranchiæ absent; gill-membranes united. Spinous dorsal well developed; 3 anal spines; caudal of 14 principal rays, 12 branched. Lateral line interrupted. Vertebrae 25 or 26 (13-14+12); præcaudals with parapophyses from the third or fourth; ribs sessile, inserted above and behind the parapophyses.

This family includes two genera only, *Pristolepis*, Jerd., and *Badis*, Bleek. Both have a well-developed mesopterygoid, which in *Pristolepis* bears a patch of conical teeth. In *Pristolepis* the parasphenoid teeth are obtuse, rounded molars; they form a large patch in the roof of the mouth which is opposed to a similar group of teeth on the tongue; the first 3 suborbitals give rise to a rather broad subocular shelf, the supraoccipital and parietal crests are strong and the pelvic fin has a scaly axillary process. In *Badis* the parasphenoid teeth are conical and form a small group, which is placed posteriorly; the suborbitals are not ossified and there is no subocular shelf; the skull is smooth and rounded above, the occipital crest does not extend forward on to the frontals, parietal crests are not developed, and the pelvic fin has no scaly axillary process.

#### Fam. 46. *Nandidæ*.

Mouth large, very protractile, the præmaxillary pedicels long, lying in a hollow formed by the bifurcation of the occipital crest; distal extremity of præmaxillary ramus articulated to outer face of maxillary; maxillary exposed; no supramaxillary. Villiform teeth in the jaws and on vomer and palatines. Pseudobranchiæ absent; gill-membranes not united. Spinous dorsal well developed; anal spines 3 or 4; caudal of 14 or 16 principal rays, 12 or 14 branched; pelvic fin without scaly axillary process. Lateral

line interrupted. Vertebrae 23 (10-13 + 10-13); præcaudals with parapophyses from the seventh or eighth; last 2 to 4 pairs of ribs on parapophyses.

All the genera have a well-developed mesopterygoid. *Nandus* has 3 or 4 anal spines, a very small patch of teeth on the parasphenoid just in front of the upper pharyngeals, 13 + 10 vertebrae, and no subocular shelf.

*Polycentrus* and *Polycentropsis* have numerous anal spines, no parasphenoidal teeth, and 10 + 13 vertebrae. In *Polycentrus* the subocular shelf is narrow, in *Polycentropsis* it is a triangular lamina. *Monocirrus* is allied to *Polycentrus*.

#### Fam. 47. Hoplegnathidæ.

Probably related to the Lutianidæ and Lethrinidæ, from which they differ especially in that the mouth is non-protractile, the maxillaries are firmly attached to the præmaxillaries, and the teeth are fused to form a beak, much as in the Scaridæ. Præmaxillary rami short; maxillary with a large posterior expansion just below its palatine articulation; palatine normal. Subocular shelf developed forward from the second suborbital, but mainly internal to the first. Gill-membranes broadly united, but free from the isthmus. Pelvic fin with a scaly axillary process. Vertebrae 25 (10 + 15); præcaudals with parapophyses from the fourth; ribs, except the first, inserted on parapophyses.

#### Fam. 48. Cichlidæ.

Fins usually as in the Serranidæ and other generalized Perciformes. A single nostril on each side; lower pharyngeals attached by their inner edges or united by suture; no subocular shelf.

#### Fam. 49. Cepolidæ.

Body very elongate and strongly compressed; no lateral line. Dorsal and anal very long, without spinous rays, connected with the reduced caudal, of about 10 rays; pelvics scarcely in advance of the pectorals, each of a spine and 5 branched rays, without axillary process. Two nostrils on each side. Mouth protractile, terminal, oblique; jaws normally formed; maxillary exposed, without supramaxillary; villiform teeth in the jaws; palate toothless. Gill-membranes not united, free from the isthmus; 6 branchiostegals; 4 gills; pseudobranchiæ present. Subocular shelf absent

or very narrow. Occipital crest short, not prominent; no parietal crests. Vertebrae numerous, 65-100, equal in number to the dorsal rays (in *C. rubescens* 15+54); præcaudals with parapophyses from the eighth; ribs on parapophyses when these are developed.

Genera: *Cepola* and *Acanthocephala*.

The Cepolidae are aberrant Serranidae, and differ from that family in little but the absence of spinous rays in the vertical fins, the reduced caudal, the elongate form, and increased number of vertebrae.

### Division 2. CIRRHITIFORMES.

I have already dealt with this group in a separate paper (Ann. & Mag. N. H. (8) vii. 1911, pp. 259-262).

The "pharyngognathous" fishes of the order Percomorphi form three well-marked and probably not specially related groups, which resemble each other in the ankylosis of the lower pharyngeals to form a single bone. Were it not for this all three would be included in the division Perciformes, since their external and anatomical characters are those of typical perciform fishes.

### Division 3. DITREMIFORMES.

Lower pharyngeals ankylosed to form a triangular plate; second upper pharyngeals absent, third and fourth united. A subocular shelf. A single posteleithrum on each side. Vertebrae 32 to 42 (13-19+19-23); first centrum rigidly united to skull; ribs sessile, attached to the centra above the parapophyses. Two nostrils on each side. Four gills.

This division includes but a single family, Ditremidae, viviparous shore-fishes of the North Pacific.

### Division 4. POMACENTRIFORMES.

Lower pharyngeals ankylosed to form a subtriangular plate; second upper pharyngeals distinct, third and fourth united. A subocular shelf. Two posteleithra on each side. Vertebrae 26 (11+15); first centrum normally articulated with skull; ribs inserted in sockets at the distal extremities of transverse parapophyses. A single nostril on each side.  $3\frac{1}{2}$  gills.

This division also includes but a single family, the Pomacentridae, littoral fishes of warm seas.

## Division 5. LABRIFORMES.

Lower pharyngeals ankylosed ; second upper pharyngeals united with third and fourth. No subocular shelf. Two postcleithra on each side. Vertebrae 23 to 53 (9-31 + 14-22) ; first centrum normally articulated with skull ; ribs attached above and behind parapophyses, which usually bear them away from the centra. Two nostrils on each side.  $3\frac{1}{2}$  gills.

## Fam. 1. Labridæ.

Mouth protractile ; præmaxillary pedicels well developed, usually extending to the frontals ; dentary firmly attached to articular. Teeth in jaws usually separate. Dentigerous portion of lower pharyngeal ovate, triangular, Y-shaped or T-shaped, with conical, granular, or molariform teeth ; upper pharyngeals similarly toothed, stout bones with concave upper surfaces supported by a pair of convex apophyses of the parasphenoid. Each pelvic fin of a spine and 5 branched rays. Vertebrae 23 to 41 (9-20 + 14-22) ; præcaudals with parapophyses ; all the ribs on parapophyses (except in *Epibulus*).

## Subfam. 1. JULIDINÆ.

Dorsal VIII-XI 9-14, the spines all similar. Anal II-III 9-14. Vertebrae 24 to 26 (9-10 + 15-16) ; all the ribs on parapophyses. Jaws with conical or compressed teeth, the anterior more or less enlarged and canine-like ; lower pharyngeal triangular or Y-shaped, with conical or obtuse teeth. Frontals hollowed out anteriorly for reception of the præmaxillary pedicels ; occipital and parietal crests not extending forward beyond middle of orbits.

The genera may be thus arranged :—

- I. Lateral line continuous ; cheeks and opercles scaly ; 9 to 11 dorsal spines . . . . . *Pteragogus*, *Duymœria*, *Labrichthys*, *Labroides*.
- II. Lateral line interrupted ; cheeks and opercles scaly ; 9 dorsal spines, *Doratonotus*.
- III. Lateral line continuous ; head naked ; 8 or 9 dorsal spines.  
*Anampses*, *Hemigymnus*, *Julis*, *Leptojulis*, *Pseudojulis*, *Stethojulis*, *Platyglossus*, *Halichæres*, *Iridio*,  
*Guentheria*, *Coris*, *Cheilio*, *Gomphosus*.

Fishes of tropical and subtropical seas.



Subfam. 2. *Xyrichthyinæ*.

Dorsal IX 12, the two anterior spines flexible, often forming a separate fin. Anal III 12. Vertebrae 25 (9+16); all the ribs on parapophyses. Teeth in jaws conical, with anterior canines; lower pharyngeal triangular or Y-shaped, with conical teeth. Frontals not hollowed out anteriorly; parietal crests vestigial or absent.

*Cymolutes*, *Novaculichthys*, *Xyrichthys*, *Iniistius*, from tropical and subtropical seas.

Subfam. 3. *Cheilininæ*.

Dorsal IX–XI 9–11. Anal III 8–9. Vertebrae 23 (9+14); all the ribs on parapophyses. Teeth in jaws conical, with anterior canines; lower pharyngeal T-shaped, with conical or obtuse teeth. Frontals not hollowed out anteriorly; occipital and parietal crests strong, extending forward to above anterior margin of orbit. Mouth moderately protractile, the premaxillary pedicels not reaching the frontals; hyopalatine bones normal.

*Cheilinus*, *Pseudocheilinus*, *Cirrhilabrus*, from the Indo-Pacific.

Subfam. 4. *Epibulinæ*.

Differ from the preceding in that the first 3 ribs are sessile and in the extraordinarily protractile mouth, the premaxillary pedicels reaching the occiput and flattening out the occipital crest. The palatine is disconnected from the suspensorium, the pterygoid and mesopterygoid are absent, and the proximal end of the long slender quadrate is movably articulated with the præoperculum and the lower ends of the metapterygoid and symplectic.

*Epibulus insidiator* from the Indo-Pacific.

Subfam. 5. *Clepticinæ*.

Dorsal XII 10. Anal III 12. Vertebrae 27 (10+17). Mouth small, strongly protractile, feebly toothed. Lower pharyngeal small, Y-shaped; teeth of upper and lower pharyngeals confluent, forming vertical plates with denticulated edges.

*Clepticus parraë*, Schneid., from the West Indies.

Subfam. 6. *HARPINÆ*.

Dorsal XI–XIV 7–11. Anal III 9–14. Vertebrae 27–30 (11–13+16–17); all the ribs on parapophyses. Teeth in jaws conical, uniserial, with anterior canines; lower pharyngeal a subtriangular or T-shaped plate, broader than long, with blunt teeth forming a pavement. Frontals hollowed out anteriorly for reception of the præmaxillary pedicels; occipital crest strong and parietal crests well developed.

*Lachnolaimus*, *Harpe*, *Pimelometopon*, *Semicossyphus*, *Trochocopus*, *Decodon*, *Xiphochilus*, *Chærops*, from tropical and temperate seas.

Subfam. 7. *PSEUDODACINÆ*.

Dorsal XI 12. Anal III 14. Jaws anteriorly with two pairs of broad incisors; lateral teeth confluent to form a sharp-edged plate. Lower pharyngeal an ovate plate with concave upper surface, much longer than broad, with several series of obtuse teeth forming a pavement and with a short anterior stem bearing a single series of 3 conical teeth.

*Pseudodax moluccanus*, Cuv. & Val., from the Indian Ocean and Archipelago, seems not very remote from *Chærops*.

Subfam. 8. *LABRINÆ*.

Dorsal XIII–XXI 8–14, the spines pungent. Anal III–VI 7–11, not longer than the soft dorsal. Vertebrae 31–41 (13–20+18–22); all the ribs on parapophyses. Jaws with conical teeth increasing in size anteriorly; lower pharyngeal a subtriangular plate, with the teeth acutely or obtusely conical. Frontals hollowed out anteriorly for reception of the præmaxillary pedicels; occipital and parietal crests well developed.

*Labrus*, *Crenilabrus*, *Ctenolabrus*, *Tautogolabrus*, *Tautoga*, *Acantholabrus*, *Centrolabrus*, from the North Atlantic and Mediterranean.

Subfam. 9. *MALACOPTERINÆ*.

Dorsal XVIII 14, the spines flexible. Anal III 18, longer than soft dorsal. Teeth in jaws conical, uniserial, enlarged anteriorly.

*Malacopterus reticulatus*, Cuv. & Val., from Chile.

Fam. 2. *Odacidæ*.

Mouth non-protractile, but jaws formed as in the Labridæ;

teeth in jaws coalescent, forming a sharp-edged plate; pharyngeals as in the Labridæ: pharyngeal teeth granular, forming a pavement. Dorsal spines flexible, numerous (16 to 24); each pelvic fin of a spine and 4 soft rays. Scales small or moderate; lateral line continuous. Skull flattish above, with a more or less distinct interorbital depression for the reception of the præmaxillary pedicels; a short occipital, but no parietal crests. Vertebrae 36 to 53 (19-31 + 17-22); all the ribs on parapophyses.

Four genera: *Olistherops*, *Coridodax*, *Odax*, and *Siphonognathus*, from the coasts of Australia and New Zealand. *Siphonognathus* is a remarkable type, very elongate, with the head like that of a *Fistularia*, and without pelvic fins.

### Fam. 3. Scaridæ.

Mouth non-protractile; maxillary firmly attached to præmaxillary; dentary movably articulated with articular; jaws short and powerful, with the teeth united to form a pair of sharp-edged plates, recalling the beak of a parrot. Denti-gerous portion of lower pharyngeal quadrangular, with longitudinal series of transversely expanded linear teeth forming a pavement; upper pharyngeals similarly toothed, produced upwards into vertical plates with thickened convex upper edges moving backwards and forwards in a pair of grooves on the parasphenoid. Scales large, about 25 in a longitudinal series; lateral line abruptly decurved or interrupted posteriorly. Dorsal fin of 9 spines and 10 or 11 soft rays, anal of 2 or 3 spines and 8 to 10 soft rays, pelvies of a spine and 5 soft rays. Skull with occipital crest strong and parietal crests well developed. Vertebrae 25 (9-10 + 15-16); all the ribs on parapophyses.

*Scarus*, *Pseudoscarus*, *Callyodon*, *Sparisoma*, &c., shore-fishes of the tropics.

## Division 6. GADOPSIFORMES.

### Fam. Gadopsidæ.

*Gadopsis* scarcely differs from the Perciformes in osteology, but there is no mesopterygoid and there are 2 radials on the hypercoracoid and 2 on the hypocoracoid. The pelvic fins are jugular, each reduced to a small spine and a bifid ray. Against Blennioid relationships are the intervention of the prootic between parasphenoid and alisphenoid, the 3 anal spines, the dorsal and anal rays more numerous

than the corresponding myotomes. Vertebrae 21+26; ribs, except the first 2 or 3, on strong parapophyses.

#### Division 7. TRICHODONTIFORMES.

This division includes a single family, differing from the Perciformes in the pectoral fin-skeleton.

##### Fam. Trichodontidæ.

This family includes 2 genera, *Trichodon* and *Arctoscopus*, related to the Perciformes. The external characters are given by Jord. & Everm. (Bull. U.S. Nat. Mus. xlvii. p. 2295, figs. 806, 807). The principal osteological characters of *Trichodon trichodon* are as follows:—Skull flattish above, without crests or ridges on upper surface; suborbitals ossified, without subocular shelf; jaws normally formed, the maxillary broadest distally, without supramaxillary; mesopterygoid vestigial or absent; head skeleton otherwise apparently Perciform. Post-temporal forked; hypercoracoid and hypocoracoid separated; radials 4, rather large and laminar, only the uppermost on the hypercoracoid. Pelvic bones rather long and narrow. Vertebrae 49 (17+32); posterior præcaudals with parapophyses; ribs on parapophyses when these are developed.

#### Division 8. AMMODYTIFORMES.

##### Fam. Ammodytidæ.

Body elongate, naked or scaly. Vertical fins without spines, the dorsal rays nearly equal in number to the vertebrae below them, the caudal of 15 principal rays, 13 branched; pectorals rather low; pelvic fins, when present, jugular, very small, of a spine and 3 soft rays. Snout rather long and pointed; eyes lateral; mouth protractile, terminal, with the lower jaw prominent; præmaxillary slender; maxillary not exposed, without supramaxillary, proximally with an anterior expansion or process, which meets its fellow above the short præmaxillary pedicels; teeth in jaws minute or absent; palate toothless. Gill-membranes free from the isthmus; 4 to 8 branchiostegals; 4 gills; pseudobranchiæ. Head-skeleton normally Percoid as regards number and arrangement of bones; suboperculum very large, projecting considerably beyond



operculum; skull long, flattish above, with a short occipital and no parietal crests; nasals long, nearly or quite meeting above the mesethmoid; no subocular shelf. Pectoral arch Perciform, the 4 radials normally hourglass-shaped, only the lowest on the hypocoracoid. Vertebrae 69 (40 + 29) in *Ammodytes lanceolatus*; first very short, with the centrum convex anteriorly, fitting the single concavity formed by the basioccipital and exoccipitals; latter meeting above the former; ribs blade-like, anteriorly sessile, posteriorly on short parapophyses; epipleurals mostly on ribs.

Genera: *Embolichthys*, *Bleekeria*, *Ammodytes*, *Hyperoplus*, *Hypoptychus*.

The systematic position of this family has been the cause of considerable discussion. Boulenger interpreted the Oligocene *Cobitopsis*, with abdominal pelvic fins, as a member of this family. After examination of the examples of *Cobitopsis acutus* in the British Museum collection I have doubt that this fish is a congener of the existing Scombresocid, *Chriodorus atherinoides* of the coasts of Florida.

I have carefully examined a spirit-specimen of *Bleekeria callolepis* and compared it with *Ammodytes*; the two genera are very closely related, and *Embolichthys*, Jordan, scarcely differs from *Bleekeria* except in the presence of jugular pelvic fins.

The nearest allies of the Ammodytidae among the Percoids seem to be the Percophiidae; but the relationship is not very close, and the Ammodytidae may well form a separate division, Ammodytiformes.

## Division 9. CHAMPSODONTIFORMES.

### Fam. Champsodontidae.

*Champsodon* differs from the Trachiniformes in that the small pectoral fin has the base oblique; the radials are elongate hourglass-shaped, 3 on the hypercoracoid, which is quite narrow and is pierced by a small foramen, and 1 on the hypocoracoid. Spinous dorsal short, separate; soft dorsal and anal long; pelvies large, close together, well in advance of the pectorals. Mouth oblique; maxillary exposed; cardiform teeth in jaws and in two separate patches on vomer. Gill-membranes separate, free. No mesopterygoid. Bones of skull arranged as in normal Perciformes. Skull depressed, flat above, expanded behind the orbits. Vertebrae 31 (12 + 19); praecaudals with parapophyses from the

fourth; ribs on parapophyses when these are developed; epipleurals attached near insertion of ribs.

*Centropercis nudivittis*, Ogilb., 1895 (Waite, Mem. Austral. Mus. iv. 1, 1899, pl. xi. fig. 2), is evidently closely related to *Champsodon*.

#### Division 10. TRACHINIFORMES.

This is an unsatisfactory and perhaps artificial assemblage of families. The dorsal and anal fins are more or less elongate, the latter preceded by only 1 or 2 feeble spines, the pectorals have vertical bases and the pelvics, inserted below or in advance of the pectorals, have the middle or inner rays longest. The head-skeleton is Perciform, but a constant feature is the absence of well-marked crests on the upper surface of the skull. The pectoral radials are 3 or 4 in number, the 2 lowest inserted on the hypocoracoid. For the whole or the greater part of the length of the soft dorsal fin there is one ray to each myotome.

#### Fam. 1. Opisthognathidæ.

Lateral line single, running high, incomplete, ending near middle of dorsal fin. Dorsal continuous, with the spinous and soft-rayed portions subequal; anal with 2 spines; caudal with 14 or 15 principal rays, 12 or 13 branched; pelvics in advance of the pectorals, close together, each of a spine and 5 soft rays, without scaly axillary process. Mouth terminal, nearly horizontal, protractile; jaws normally formed; maxillary broad, exposed, with supra-maxillary; villiform or cardiform teeth in jaws and sometimes on vomer. Two nostrils on each side. Gill-membranes free from the isthmus; 6 branchiostegals; 4 gills; pseudobranchiæ present. A narrow subocular shelf. Skull narrow between and expanded behind the orbits; postorbital part evenly convex above; occipital crest only on the posterior face of skull, which is long and oblique; no parietal crests; exoccipital condyles separate; prootics forming a roof for myodome and basisphenoid present. Foramen in hypercoracoid; radials rather broad and flat, 2 on hypercoracoid and 2 on hypocoracoid. Vertebrae 29 (10 + 19); præcaudals with parapophyses from the fifth; 3 ribs sessile, 5 on parapophyses; epipleurals on ribs.

Principal genera: *Gnathypops*, *Staliæ*, *Opisthognathus*.

## Fam. 2. Bathymasteridæ.

Lateral line terminating near end of the many-rayed dorsal fin, which has only a few spines anteriorly; no supramaxillary; vomerine and palatine teeth. No subocular shelf from the second suborbital, but the first and the præorbital form a shelf for attachment to the lateral ethmoid. Prootics not forming a roof for the myodome; no basisphenoid. Vertebrae 49 to 52 (14-15 + 35-37); præcaudals with parapophyses from the third; ribs, except the first, on parapophyses. In other characters similar to the Opisthogathidæ, to which they are closely related.

Principal genera: *Bathymaster*, *Rathbunella*.

## Fam. 3. Pinguipedidæ.

Lateral line complete, continuous. Dorsal fin elongate, continuous, with a few spines anteriorly; rays equal in number to the vertebrae below them, each basal attached to its own neural spine. Anal long, with 2 spines. Caudal with 15 or 17 principal rays, 13 or 15 branched. Pelvies below or somewhat in advance of the pectorals, fairly wide apart, each of a spine and 5 branched rays, without scaly axillary process. Mouth protractile, terminal, slightly oblique; jaws normally formed; maxillary concealed, without supramaxillary; teeth in jaws villiform, with canines; teeth on vomer and usually on palatines. Two nostrils on each side. Gill-membranes united, free from the isthmus; 6 branchiostegals; 4 gills; pseudobranchiæ present. No subocular shelf. Skull flattish above, rather strongly expanded behind the orbits, the sphenotics with prominent projections; occipital crest short and parietal crests indistinct or absent; exoccipital condyles well separated; a basisphenoid. Foramen in hypercoracoid (*Pinguipes*) or between it and hypocoracoid (*Parapercis*); radials hour-glass-shaped, 4 in number, 2 on hypocoracoid; postcleithral laminar, 2 on each side. Vertebrae 30-38 (10-16 + 20-22); præcaudals with parapophyses from the third; all the ribs, or all but the first, on parapophyses; epipleurals attached to parapophyses or to ribs near their insertion.

Principal genera: *Pinguipes*, *Parapercis*, *Neopercis*.

## Fam. 4. Chimarrichthyidæ.

*Chimarrichthys*, with a single species from mountain torrents of New Zealand, differs from the Pinguipedidæ

in that the pelvic fins are somewhat more advanced and wider apart, and the mouth is non-protractile and inferior. Pectoral arch much as in *Pinguipes*, but the radials squarish. Vertebrae 33 (*fide* Waite, Trans. N.Z. Inst. xlii. 1909, p. 390).

#### Fam. 5. Trachinidæ.

Fins as in the Pinguipedidæ, except that the caudal has 13 principal rays, 11 branched, and the pelvic fins are close together and well in advance of the pectorals. Mouth oblique, maxillary exposed, subocular shelf well developed and mesopterygoid broad. Foramen between hyper- and hypocoracoid; radials very short, 2 on hyper- and 2 on hypocoracoid. Vertebrae 42 (12+30); præcaudals with parapophyses from the eighth; ribs and epipleurals inserted together, on parapophyses when these are developed. In other characters resembling the Pinguipedidæ.

A single genus, *Trachinus*.

#### Fam. 6. Percophiidæ.

Lateral line complete, continuous. Spinous dorsal separate, of a few slender spines; soft dorsal and anal very long; rays of soft dorsal equal in number to the vertebrae below them, each basal attached to its own neural spine; one anal spine; caudal with 15 principal rays, 13 branched; pelvics in advance of the pectorals, wide apart, each of a spine and 5 branched rays, without scaly axillary process. Mouth terminal, oblique, protractile; jaws normal; maxillary exposed, without supramaxillary; teeth in jaws cardiform, with canines; teeth on vomer and palatines. Two nostrils on each side. Gill-membranes not united, free from the isthmus; 7 branchiostegals; 4 gills; pseudobranchiæ present. A subocular shelf; mesopterygoid broad; skull much as in *Trachinus*, but more depressed, with the exoccipitals united behind the supraoccipitals, forming a roof for the *foramen magnum*. Pectoral arch as in *Pinguipes*, the radials a little shorter. Vertebrae 77 (22+35); posterior præcaudals with short parapophyses; ribs and epipleurals mostly sessile, inserted together, the latter the stronger.

#### Fam. 7. Bembropsidæ.

This family includes two closely related genera, *Bembrops* (*Hypsicometes*) and *Chrionema*, with short, separate spinous



dorsal, rather long soft dorsal and anal, no anal spines, caudal with 10 or 11 branched rays, and pelvics well separated, jugular, each of a spine and 5 soft rays. Body scaly; lateral line descending anteriorly, for most of its course nearer anal than dorsal fin. Gill-membranes not united, free from isthmus; opercular membrane produced; 7 branchiostegals; 4 gills; pseudobranchiæ. Eyes large; interorbital region narrow; suborbitals unossified; snout broad, depressed; mouth terminal, protractile, with the lower jaw prominent; maxillary exposed; villiform teeth in jaws and on vomer and palatines. In *Bembrops* the hypercoracoid is perforate and there are 3 radials, corresponding in form and position to the 3 lower radials of *Parapercis*.

#### Fam. 8. Hemerocætidæ.

Body scaly; lateral line running along middle of side. Spinous dorsal, if present, short; soft dorsal and anal long; no anal spines; caudal of 10 principal rays, 8 branched; pelvics jugular, well separated, each of a spine and 5 branched rays. Mouth protractile, terminal, with the lower jaw somewhat the shorter; maxillary slightly exposed distally, without supramaxillary, with a forwardly directed spine just in front of the præorbital; villiform teeth in the jaws and in 2 separate patches on the vomer; none on the palatines. Eyes rather large and close together; suborbitals well ossified. Gill-membranes not united, free from isthmus; 6 branchiostegals; 4 gills; pseudobranchiæ. Head-skeleton as in the Pinguipedidæ, but no basisphenoid and no prominent sphenotic process; pectoral arch similar, but a large foramen between hypercoracoid and hypocoracoid and uppermost radial completely fused with the former. Vertebrae (in *Hemerocætes*) 48 (13 + 35); præcaudals with parapophyses from the fifth; ribs not ossified, but a series of epipleurals.

Two genera: *Acanthaphritis* (*Pteropsaron*) and *Hemerocætes*.

#### Fam. 9. Trichonotidæ.

Body scaly; lateral line running along middle of side. Dorsal long, with a few unarticulated rays anteriorly; anal long, with a feeble spine; caudal of 13 principal rays, 11 branched; pelvics jugular, separated by a narrow interspace, each of a spine and 5 branched rays. Mouth protractile, terminal, with the lower jaw projecting; maxillary not or

scarcely exposed, without spine ; villiform teeth in jaws and on vomer and palatines. Eyes close together ; suborbitals well ossified. Gill-membranes not united, free from isthmus ; 7 branchiostegals ; 4 gills ; pseudobranchiæ. Head-skeleton and pectoral arch much as in *Hemerocætes*. Vertebrae 53 (23 + 30) ; only the last 4 præcaudals with parapophyses ; ribs and epipleurals sessile, inserted together.

*Trichonotus* and *Tæniolabrus*.

#### Fam. 10. *Creediidæ*.

Body elongate, scaly ; lateral line running very low. Vertical fins without spines ; dorsal, of 12 or 13 rays, placed above and much shorter than the anal, which has 26 or 27 ; caudal with 10 principal rays, 8 branched ; pelvics jugular, narrowly separated, each of a spine and 4 soft rays. Snout conical ; eyes close together ; suborbitals well ossified ; mouth protractile, terminal, with the lower jaw the shorter ; small pointed teeth in the lower jaw ; upper jaw and palate toothless. Gill-membranes not united, free from isthmus ; 7 branchiostegals ; 4 gills ; pseudobranchiæ. Hypercoracoid with a small foramen near its lower margin.

This family is related to the preceding ; it includes but a single species. This remarkable little fish, *Creedia clathrisquamis*, Ogilby, 1898, from the coasts of New South Wales and Victoria, is represented in the British Museum by a specimen of 70 mm. from Port Phillip, Victoria. This agrees with the type and differs from the example figured by Waite (Mem. Austral. Mus. iv, 1, 1899, p. 63) in that the premaxillaries form a fleshy projection in front of the mouth ; the absence of this projection in Waite's example is probably due to an accident, or possibly to a congenital malformation ; it is unlikely that it is a sexual character.

#### Fam. 11. *Limnichthyidæ*.

Body elongate, scaly ; lateral line complete, running low posteriorly. Vertical fins without spines ; dorsal, of 19 to 26 rays, placed above the anal, which has 27 to 29 ; caudal with 12 principal rays ; pelvics jugular, close together, each of a spine and 5 branched rays. Snout conical ; eyes close together ; mouth protractile, terminal, with the lower jaw the shorter ; villiform teeth in jaws and on palatines. Gill-openings wide, the membranes free from isthmus ; 7 branchiostegals.

Two genera, each with a single species, from Eastern Australia, may be distinguished thus:—

Dorsal 25-26, slightly shorter than anal; pectoral normal; vomer toothless .....	<i>Linnichthys</i> .
Dorsal 19, shorter than anal; pectoral with lower rays thickened and modified; vomer toothed.....	<i>Schizochirus</i> .

These fishes have been described by Waite (Rec. Austral. Mus. v. 1901, pt. 3, p. 178, pl. xxiii. fig. 4, and pt. 4, p. 241, pl. xxvi. fig. 3).

### Fam. 12. *Leptoscopidæ*.

Body elongate, moderately compressed or cylindrical, scaly; lateral line complete, running along middle of side. Vertical fins without spines, the dorsal and anal long, with the rays equal in number to the vertebræ below or above them; caudal of 12 or 13 principal rays; pectorals broad-based; pelvics well separated, in advance of the pectorals, each of a spine and 5 branched rays. Mouth protractile, terminal, very oblique, with the lower jaw prominent; præmaxillary ramus with a posterior expansion at its distal end; maxillary exposed, without supramaxillary, broadest distally; jaws with villiform teeth. Head covered with skin. Gill-membranes free from isthmus; 6 branchiostegals; 4 gills; pseudobranchiæ; opercular bones normal; suborbitals ossified, without subocular shelf. No mesopterygoid; metapterygoid large, articulating with sphenotic. Skull depressed, flattish above; parietals separated by supra-occipital; a short occipital and no parietal crests; exoccipital condyles widely separated; no basisphenoid. Post-temporal forked, normally attached; hypercoracoid and hypocoracoid broad; foramen in hypercoracoid; radials 4, short and broad, rigidly attached,  $2\frac{1}{2}$  on hypocoracoid; pelvic bones flat, horizontal. Vertebræ 43-46 (10+33-36); præcaudals gradually increasing in length to the eighth; parapophyses absent or vestigial; no ribs, but a series of epipleurals.

The two genera, from the coasts of Australia and New Zealand, may be distinguished thus:—

Teeth in jaws, in 2 separate patches on vomer and on palatines.	<i>Leptoscopus</i> .
Palate toothless; head broad; eyes superior .....	<i>Crapatalus</i> .

### Fam. 13. *Uranoscopidæ*.

Body moderately elongate, cylindrical, naked or scaly; lateral line running high. A short spinous dorsal often

present; soft dorsal and anal moderately long; pelvics narrowly separated. Head broad, with the eyes superior; mouth terminal, nearly vertical, with the lower jaw prominent; villiform teeth in jaws, in 2 separate patches on vomer, and on palatines. Bones of head exposed; præ-orbital and first suborbital forming a shelf; operculum large and suboperculum small. Mesopterygoid present, but small and narrow; metapterygoid large, but not reaching sphenotic. Parietals meeting above supraoccipital. Upper fork of post-temporal laminar, rigidly united to skull; radials still shorter than in the *Leptoscopidæ*, united to hypercoracoid and hypocoracoid by suture or ankylosis. Pelyic bones erect, vertical laminae. Vertebrae 26-30 (11-12+16-18); first moderately long, firmly attached to skull; præcaudals increasing in length from the second and third, which are very short, to about the seventh; præcaudals with parapophyses from the sixth; ribs present, anteriorly attached to under surface of epipleurals, posteriorly on parapophyses.

In other characters similar to the *Leptoscopidæ*, to which they are closely related.

#### Division 11. NOTOTHENIIFORMES.

I have recently characterized this group and made a revision of the species (*Trans. R. Soc. Edinburgh*, xlix, 1913, pp. 249-289).

#### Division 12. CALLIONYMIFORMES.

The peculiarities of the skeleton of the head and of the pectoral arch and the reduced number of vertebrae warrant the recognition of a separate division for the *Callionymidæ*. This family may be related to the *Pinguipedidæ*, but is much more specialized. The *Gobiesocidæ* differ in many characters of importance.

#### Fam. 1. *Callionymidæ*.

Body naked; lateral line present. Spinous dorsal separate, of 3 or 4 slender flexible spines; anal similar to soft dorsal, without distinct spine, with 7 to 12 rays; caudal with about 10 principal rays; pelvics in advance of the pectorals, wide apart, each of a spine and 5 branched rays. Mouth protractile, terminal, horizontal, the lower jaw not prominent;



præmaxillary ramus without posterior expansion ; maxillary concealed, without supramaxillary ; small teeth in the jaws, none on the palate. Gill-membranes broadly joined to the isthmus ; 6 branchiostegals ; 4 gills ; pseudobranchiæ. Præoperculum with a strong spine at the angle ; operculum normal. Suborbitals ligamentous ; no mesopterygoid or metapterygoid ; skull depressed, narrowed between and expanded behind the orbits ; sphenotic with a curved projection, as in the Pinguipedidæ ; occipital crest short and parietal crests absent ; exoccipital condyles widely separated ; no basisphenoid ; mesethmoid ossified as an interorbital septum. Post-temporal forked, but forming an integral part of the skull ; supracleithrum slender, nearly horizontal, and directed outwards ; postcleithrum a single slender rod ; foramen between hypercoracoid and hypocoracoid ; radials large, flat, 3 in number, all on the hypocoracoid. Vertebrae 21 (7+14), compressed, especially posteriorly ; neural spines below the dorsal fin and hæmal spines above the anal bifid for reception of the basalia ; no ribs ; præcaudals, except the first, with long epipleurals, the anterior sessile, the posterior ones on short parapophyses.

Principal genera : *Callionymus*, *Synchiropus*, *Dactylopus*.

## Fam. 2. Draconettidæ.

Evidently related to the Callionymidæ, with which they agree in the number of vertebrae, as I have ascertained by counting the myotomes in *Centrodraco* \* *acanthopoma*, Rgn. This species, from the North Atlantic, differs from *Draconetta* of the North Pacific in that the dorsal spines are stout and pungent, the second much the longest, and in the presence of a single series of teeth on vomer and palatines. I have ascertained that the pectoral radials are large, elongate as in *Callionymus*. The family differs externally from the Callionymidæ in the absence of a lateral line, the entire præoperculum, and the reduction of the operculum and suboperculum to a pair of strong spines ; in the last feature these fishes resemble *Harpagifer*.

\* This generic name is here proposed for the first time.

## PROCEEDINGS OF LEARNED SOCIETIES.

## GEOLOGICAL SOCIETY.

November 20th, 1912.—Dr. Aubrey Strahan, F.R.S., President,  
in the Chair.

The following communication was read:—

‘On the Genus *Autophyllum*.’ By Stanley Smith, B.A.,  
M.Sc., F.G.S., Clare College, Cambridge.

*Autophyllum* is a genus belonging to the Clisiophyllid group. It is found in the Upper Beds of the Carboniferous Limestone Series in Britain and on the Continent. It appears in the lower part of the *Dibunophyllum* Zone ( $D_1$ ), becomes common in the middle subdivision of the zone ( $D_2$ ), and is plentiful in the highest limestones investigated ( $D_3$ ).

The coral was first described by David Ure, in 1793, as *Fungites*; the genus was established by Milne-Edwards & Haime in 1850. The Author includes in this genus Thomson’s genus *Cyclophyllum*. The genus is described in detail, and then the ontogenesis is discussed. The development of the various items of coral anatomy is first treated; and the Author subsequently deals with the growth of the coral considered as a whole, six stages being recognized by him. The forms found in  $D_1$  do not advance beyond stage *d*.

Structural variation is then considered. The Author regards all the species previously described as variations of the same species, but recognizes several well-marked types and a number of time mutations. Many specimens of the coral display the phenomenon of rejuvenescence. The structural changes observed are described, and the nature of the rejuvenescence is briefly discussed.

December 4th, 1912.—Dr. Aubrey Strahan, F.R.S., President,  
in the Chair.

The following communications were read:—

1. ‘On the Lower Palæozoic Rocks of the Cautley District (Yorkshire).’ By John Edward Marr, Sc.D., F.R.S., V.P.G.S.

The following classification is suggested for the Ordovician rocks of the district:—

	{	Ashgill Shales.	
		Beds above the Volcanic Group.	
ASHGILLIAN.	{	Contemporaneous Volcanic Group.	} <i>Staurocephalus</i> Beds.
		Beds below the Volcanic Group.	
		<i>Phacops-robertsi</i> Beds.	
CARADOCIAN.		<i>Calymene</i> Beds.	

The *Phacops* and *Calymene* Beds are remarkably similar in lithological characters (dark calcareous shales and impure limestones), but the palæontological change is at the top of the *Calymene* Beds, and the fauna of the *Phacops* Beds is allied to that of the succeeding strata.

In addition to other fossils, the Ashgillian strata contain graptolites, which have not been found, however, in the Ashgill Shales. *Dicellograptus anceps* Nich. comes in the *Phacops* Beds, and ranges

up into the beds above the Volcanic Group. The Ashgillian beds are, therefore, the zone of *Dicellograptus anceps*.

The succession in this district is much clearer than in the Lake District, and it is suggested that it be adopted as the type sequence for the Ashgillian beds of the North of England.

Some notes on the faunas of the Silurian rocks, of which the detailed sequence has been previously established, are given.

2. 'The Trilobite Fauna of the Comley Breccia-Bed (Shropshire).'  
By Edgar Sterling Cobbold, F.G.S.

The Author describes a trilobitic fauna from the matrix of a breccia of Middle Cambrian age, found near Comley Brook, in one of the excavations made for the Excavations Committee of the British Association. This fauna includes forms referred to *Agraulos* cf. *quadrangularis* Whitfield, *Conocoryphe aqualis* Linnarsson, *C. bufo* Hicks, *C. impressa* Linnarsson, *Microdiscus punctatus* Salter, together with new species of *Paradoxides*, *Dorypyge*, *Ptychoparia* (*Liostracus*), and some indeterminate forms, provisionally referred to *Agraulos* (*Strenuella*).

This Breccia-Bed is made up of the recompactied waste of Lower Cambrian sandstones, many of the included blocks yielding species belonging to the *Protolenus-Callavia* fauna. It rests directly upon bedded Lower Cambrian sandstone, and is therefore regarded as a basal deposit of the Middle Cambrian.

The fossils contained in the matrix indicate an horizon that is probably equivalent to a part of the *Paradoxides-tessini* Zone of Scandinavia. As they are specifically distinct from those of the Quarry-Ridge Grits of Comley, which are also basal but rest upon Lower Cambrian limestones containing the *Protolenus-Callavia* fauna, the inference is drawn that the two deposits are separated by a distinct interval of Cambrian time.

3. 'Two Species of *Paradoxides* from Neve's Castle (Shropshire).'  
By Edgar Sterling Cobbold, F.G.S.

The Author figures portions of two species of *Paradoxides*, collected in 1892 by Mr. J. Rhodes for H.M. Geological Survey. These are referred to *P. hicksi* Salter, and to a new variety of *P. bohemicus* Böeck.

Species of *Agnostus*, *Ptychoparia* (*Liostracus*), *Agraulos*, *Hypolithus*, and *Acrotreta* occur in the same rock-fragments, but are not sufficiently well-preserved for exact specific determination.

December 18th, 1912.—Dr. Aubrey Strahan, F.R.S., President,  
in the Chair.

The following communication was read:—

'On the Discovery of a Paleolithic Human Skull and Mandible in a Flint-bearing Gravel overlying the Wealden (Hastings Beds) at Piltown, Fletching (Sussex).' By Charles Dawson, F.S.A., F.G.S., and Arthur Smith Woodward, LL.D., F.R.S., Sec.G.S. With an Appendix by Prof. G. Elliot Smith, M.D., F.R.S.

The gravel in which the discovery was made occurs in a field

near Piltown Common, in the parish of Fletching (Sussex), and is described by the first Author. In the section exposed it is about 4 feet thick. It consists, for the greater part, of waterworn fragments of Wealden ironstone and sandstone, with occasional pebbles of chert, probably from the Greensand, and a considerable proportion of Chalk-flints, which are also waterworn, all deeply stained with oxide of iron, and most of them tabular in shape. The human skull was originally found by workmen, broken up by them, and most of the pieces thrown away on the spot. As many fragments as possible were recovered by the Authors, and half of a human mandible was also obtained by the first Author from a patch of undisturbed gravel close to the place where the skull occurred. Two broken pieces of the molar of a Pliocene type of elephant and a much-rolled cusp of a molar of *Mastodon*, were also found, besides teeth of *Hippopotamus*, *Castor*, and *Equus*, and a fragment of an antler of *Cervus elaphus*. Like the human skull and mandible, all these fossils are well mineralized with oxide of iron. Many of the waterworn iron-stained flints closely resemble the 'coliths' from the North Downs, near Ightham. Mingled with them were found a few Palæolithic implements of the characteristic Chellean type. The gravel at Piltown rests upon a plateau 80 feet above the River Ouse, and at a distance of less than a mile to the north of the existing stream. It appears to cover several acres; but, at the same level on the opposite (south) side of the river, it is represented only by scattered flints. Numerous iron-stained tabular flints, like those of the Piltown gravel, have been found in the basin of the Ouse between the Chalk escarpment and Sheffield Park, and between this escarpment and Uckfield. As they are identical with the flints well-known in the plateau-deposits of the North and South Downs, it may be assumed that they have been derived from a plane, formerly existing between those two points.

The human skull and mandible, and the associated fossils, are described by the second Author. The skull (which unfortunately lacks the bones of the face) exhibits all the essential features of the genus *Homo*, with a brain-capacity of not less than 1070 c.c., but possibly a little more. It measures about 190 mm. in length from the glabella to theinion, by 150 mm. in width at the widest part of the parietal region; and the bones are remarkably thick, the average thickness of the frontals and parietals being 10 mm., while an exceptional thickness of 12 mm. is reached at one corner. The forehead is steeper than that of the Neanderthal type, with only a feeble brow-ridge; and the conformation of the occipital bone shows that the tentorium over the cerebellum is on the level of the external occipital protuberance, as in modern man. Seen from behind the skull is remarkably low and broad, and the mastoid processes are relatively small. The right mandibular ramus is nearly complete to the middle of the symphysis, lacking only the articular condyle and the upper part of the bone in advance of the molars. The horizontal ramus is slender, and, so far as preserved, resembles in shape that of a young chimpanzee (*Anthropopithecus niger*). The



lower symphyseal border is not thickened and rounded, as in man, but produced into a thin inwardly-curved flange, as in the apes. The ascending ramus is comparatively wide, with extensive insertions for the temporal and masseter muscles, and a very slight sigmoid notch above. Molars 1 and 2, which occur in their sockets, are typically human, though they are comparatively large and narrow, each bearing a fifth cusp. The socket of molar 3 indicates an equally large tooth, placed well within the ascending ramus of the jaw. The two molars have been worn perfectly flat by mastication, a circumstance suggesting that the canines resembled those of man in not projecting sensibly above the level of the other teeth. The weakness of the mandible, the slight prominence of the brow-ridges, the small backward extent of the origin of the temporal muscles, and the reduction of the mastoid processes, suggest that the specimen belongs to a female individual, and it may be regarded as representing a hitherto unknown genus and species, for which a new name is proposed.

The Authors conclude that the Piltdown gravel-bed is of the same age as the contained Chellean implements, which are not so much waterworn as most of the associated flints. The rolled fragments of molars of the Pliocene elephant and *Mastodon* are considered to have been derived with the flints from older gravels; while the other mammalian remains and the human skull and mandible, which cannot have been transported far by water, must be assigned to the period of the deposition of the gravel-bed itself. The remoteness of that period is indicated by the subsequent deepening of the valley of the Ouse to the amount of 80 feet.

In the Appendix, Prof. Elliot Smith remarks that, although the brain presents a remarkable general similarity to the well-known cranial casts of Palæolithic man, and especially to those of Gibraltar and La Quina, which are supposed to be feminine, the cast of the skull here described is smaller and more primitive in form than any of these. The most noteworthy feature is the pronounced gorilla-like drooping of the temporal region, due to the extreme narrowing of its posterior part, which causes a deep excavation of its under surface. This feeble development of the part of the brain which recent research has shown to be intimately related to the power of speech in modern man is very significant, especially when we notice that a marked boss (which, as Dr. Smith Woodward described, lends a curiously distinctive form to the brain-cast and skull, when viewed from behind) is making its appearance in precisely the spot where in modern man is developed the mechanism that permits the spontaneous elaboration of speech and the ability to name objects.

The apparent paradox of the association of a simian jaw with a human brain is not surprising to one familiar with recent research upon the evolution of man. In the process of evolving the brain of man from the ape the superficial area of the cerebral cortex had to be tripled; and this expansion was not like the mere growth of a muscle with exercise, but the gradual building-up of the most complex mechanism in existence. The growth of the brain

preceded the refinement of the features and the somatic characters in general.

There are no grounds whatever for supposing that this simian jaw and human brain-cast did not belong to one and the same individual, who was probably a right-handed female.

January 22nd, 1913.—Dr. Aubrey Strahan, F.R.S., President, in the Chair.

The following communications were read:—

1. 'The Fossil Flora of the Cleveland District of Yorkshire: I.—The Flora of the Marske Quarry.' By H. Hamshaw Thomas, M.A., F.G.S. With Notes on the Stratigraphy, by the Rev. George John Lane, F.G.S.

In this paper the Author describes several plants collected by the Rev. G. J. Lane and Mr. T. W. Saunders in the Cleveland district of Yorkshire, which were sent to Cambridge for examination. Other specimens described were obtained by the Author from the Marske Quarry and by the late Mr. Hawell, whose collection is now in the Dorman Memorial Museum, Middlesbrough.

The following species are dealt with:—*Equisetites columnaris* Brongn., *Sagenopteris phillipsi* (Brongn.) var. *major* Sew., *Laccopteris polypodioides* Brongn., *Dictyophyllum rugosum* L. & H., *Stachypteris halleri*, a new type recently described by the Author, *Coniopteris hymenophylloides* Brongn., and *C. quinqueloba* (Phill.), *Todites williamsoni* (Brongn.), *Cladophlebis denticulata* Brongn., a new species of *Marattiopsis* (a genus not hitherto recorded from Yorkshire), *Williamsonia spectabilis* Nath. (microsporophylls of which were found by the Author, throwing additional light on this type of flower), *W. whitbiensis* Nath., and a female strobilus identified as *W. sp.*, *Zamites* (*Williamsonia*) *gigas* L. & H., *Psilophyllum* (*W.*) *pecten* (Phill.), *Teniopteris vittata* Brongn., *T. major* L. & H., *T. sp.*, *Wielandiella nilssoni* (Phill.) formerly known as *Anomozamites nilssoni*, *Otozamites feistmanteli* Zigno, *O. graphicus* (Leck. ex Bean MS.), *Dictyozamites hawelli* Sew., a Cycadean stem classified as *Wielandiella sp.*, *Nilssonina mediana* (Leck. ex Bean MS.), *N. orientalis* Heer, a new species of *Pseudecten* (a genus recently founded on specimens of Cycadean fronds from the Upper Jurassic of Sutherland), *Ginkgo digitata* (Brongn.), *Baiera longifolia* (Pomel), *Czchanowskia murrayana* (L. & H.), *Elatides setosa* (Phill.), and *Taxites zamiioides* (Leck. ex Bean MS.).

The Marske flora, which includes several types not hitherto recorded from the Jurassic plant-beds of Yorkshire, is believed to be of Middle Jurassic age: specimens previously identified as *Zamites buchianus* (Ett.) and *Nilssonina schaubergerensis* (Dunk.), Wealden species, are described respectively as a new species of *Pseudecten* and *Nilssonina orientalis* Heer.

A note is appended by the Rev. G. J. Lane on the stratigraphy of the Marske Quarry, situated on the northern face of the Upleatham outlier, about a mile distant from Marske-by-the-Sea. The Marske beds are assigned to the Lower Estuarine Series.

## 2. 'The Derived Cephalopoda of the Holderness Drift.'

By Charles Thompson, B.Sc.

Although it has been known for a century that the Drift of Holderness is rich in derived fossils, for many years the collecting of them was neglected. However, in recent years, collections of the cephalopoda have been made, and it is now claimed that about a hundred and eighty species of ammonites are already in hand from the Glacial Drift. There are two important points about these specimens: the one, that a large number are new to Yorkshire lists hitherto published; the other, that the matrix of many of them cannot be matched now by our land exposures. It remains to consider whence they came.

The whole of the Lower Lias is so well represented by all its genera, and the rocky matrices are so characteristic, that it is urged that the ice plucked them from outcrops in the bed of a former North Sea; also that these outcrops show the continuity of the North Yorkshire Basin with that of North-Western Germany. The list appended to the paper supports this statement, for it shows that many gaps are now filled, which are obvious when Hyatt's lists for the two regions are compared.

The Middle and the Upper Lias afford much material, but the types are closer to those of North Yorkshire. The Oolites are very scantily represented, although the Lower Cretaceous is abundantly represented both by ammonites and by belemnites. Again, there is a great difference between the state of preservation of a collection made from the Drift, and that of one which can be made now from the Speeton Clay *in situ*. Hence, the existence of a wide spread of these clays to the east is confirmed.

The Chalk belemnites belong to a zone higher than any known in Yorkshire: therefore, they probably came from the sea-bed.

February 5th, 1913.—Dr. Aubrey Strahan, F.R.S., President,  
in the Chair.

The following communication was read:—

'On Two Deep Borings at Calvert Station (North Buckinghamshire), and on the Palæozoic Floor north of the Thames.' By Arthur Morley Davies, A.R.C.S., D.Sc., F.G.S., and John Pringle, H.M. Geological Survey.

The two borings are about 370 yards apart in a due east-and-west direction. The eastern boring gives the following section:—

*Altitude of surface=about 290 O.D.*

	<i>Thickness in feet inches.</i>	
Soil .....	4	0
Oxford Clay— <i>Ornatum</i> Zone .....	93	3
Non-sequence.		
Forest Marble .....	38	9
Non-sequence.		
Great Oolite .....	59	6
Non-sequence.		
Chipping Norton Limestones .....	7	6
Non-sequence.		
Lias—Domerian, <i>Algovianum</i> Zone to Charmouthian, <i>Jamesoni</i> Zone .....	240	6
Unconformity.		
Lower Tremadoc—Shinerton Shales .....	954	6
	1398	0



The Oxford Clay is represented by grey and blue clays, the lowest bed of which is a hard, tough, brownish clay full of broken shell-fragments: among the forms identified from it are *Cosmoceras sedgwicki* (Pratt) and *C. stutchburii*? (Pratt).

The Forest Marble consists mainly of grey and bluish-grey oolitic and earthy limestones, with grey, brown, and green clays at the base. An exceedingly bright bluish-green clay, 3 inches thick, is also present. The limestones are very fossiliferous, but the organisms are badly preserved.

The Great Oolite is represented by grey limestones and grey marly limestones, dark-grey sands, and clays. The highest member is correlated with the 'Cream Cheese' top of the Great Oolite in the Bicester cuttings. From the upper part of the section *Terebratulina bathonica* S. S. Buckman was obtained; near the base there is a 2-foot band full of *Rhynchonella* and *Ostrea*. The section is compared with the Fritwell-Ardley section on the new railway from Ashendon to Aynho.

The Chipping Norton Limestones consist of a yellowish oolitic limestone and a grey sandy limestone, also markedly oolitic.

The Lias is represented by pale-grey shales with very little variation in character. Near the base is a limestone containing fragments of Palæozoic rocks, and many fossils, of which the most abundant is *Zeilleria waterhousei* (Davidson), characteristic of the *Jamesoni* Zone. This limestone also yielded a derived fragment of *Echioceras microdiscus* (Quenstedt), a *Raricostatum*-Zone fossil.

In the western boring only, strata yielding inflammable gas were met with. Reasons are given for believing that these may have been Triassic. If not, they are probably Upper Palæozoic.

The Tremadocian shales resemble those of Shropshire: their dip varies from 40° to nearly 90°. They show interesting structures resulting from differential movement; at several horizons they yield well-preserved examples of *Clonograptus tenellus*, var. *callavei* (Lapworth) and *Obolella* (?) aff. *salteri* Holl. They are traversed by two sills of olivine-basalt. The uppermost 50 feet are stained red.

The following new reading of the Bletchley boring is proposed:—

	<i>Feet.</i>
Oxford Clay.....	192
Forest Marble .....	33
Lias (Charmouthian) .....	185

An attempt is made to express the depth of the Palæozoic floor by a contoured map, and its possible constitution and tectonic structure are discussed.



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XVIII.—*Notes from the Gatty Marine Laboratory, St. Andrews.*—No. XXXV. By Prof. M'INTOSH, M.D., LL.D., F.R.S., &c.

1. On Two Killers, *Orca gladiator* (Lacépède), Gray, stranded at St. Andrews.
2. On the British *Ammocharidæ*.
3. On *Myriochele heeri* &c. dredged in the Gulf of St. Lawrence, Canada, by Dr. Whiteaves.
4. On the British *Hermellidæ*.

1. On Two Killers, *Orca gladiator* (Lacépède), Gray, stranded at St. Andrews.

*ORCA GLADIATOR* is less common in the eastern than in the western and northern waters of Britain, for it is more frequently seen in the western bays and lochs, as well as in the adjoining Atlantic, than in the North Sea. The high dorsal "fin" is diagnostic, as it rolls upward or swims for a short time under the surface, whilst the external coloration is equally characteristic. In all probability, the abundance of seals and porpoises on the western and northern shores will sufficiently account for its prevalence. Both specimens were stranded before the autumn of 1882, and nearly at the same place, viz. the "Buru-stools," a region of sand-covered rocks almost opposite the old wooden marine laboratory on the East Bents. The first was a fine male,

stated to be over 20 feet in length (though the measurements show that it was only 20), the dead carcass of which floated shorewards on the 25th December, 1876. It was secured for the University by Prof. Pettigrew, and buried in a field on the estate of Denbræ, then in the hands of Dr. Watson Wemyss. It apparently had been forgotten, for word came to the Museum in 1882 that its bones were being sold by the farm-servants, and immediate steps were then taken to secure the remainder, which consisted of the cranium, half the mandible, a scapula, and a few ribs and vertebrae.

The other example, an old female, came on shore alive in March 1882, and its skeleton, excellently prepared by Mr. John Herd Bruce, formerly a medical student in Edinburgh, was lately secured for the University Museum. So far as was observed, the animal seemed to be feeble from old age, had nothing in its stomach, quietly allowed a rope to be hitched round its tail in front of the flukes, and without a struggle it was dragged by a boat round to the pier, where, while it was still alive, an intruder cut through the blubber, causing free bleeding, so that it died in a short time.

The adult male was measured in 1876 by Mr. William Robb, and a rough sketch of it was also made. Its length was 20 ft., or from the mouth along the curve of the under surface 21 ft. 10 in. From the mouth to the vent 13 ft.; length of the genital and vent-region 1 ft. 9 in.; and behind to the tail 7 ft. 1 in. The length along the front curve of the dorsal fin was 2 ft. 9 in. and the flipper was 2 ft. 9 in. long, a measurement which shows that the dorsal fin was not so high as those observed in former years on the western shores, or as described by Reinhardt and other Scandinavian writers. The breadth of the base of the flipper was 22 inches; the breadth of the base of the dorsal fin 24 inches; and the breadth at the base of the tail  $21\frac{1}{2}$  inches. The breadth from the mid-cleft of the tail to the outer edge of the fluke was 2 ft. 7 in., making the total breadth of the tail 5 ft. 2 in. Length from the tip of the snout to the nostril or "blower" 2 ft. 8 in., from the snout to the front edge of the dorsal fin 8 ft. 3 in.; whilst the girth from the dorsal to the middle of the abdomen was 6 ft., giving a total girth of about 12 ft.

The skull of this male has the measurements indicated in the following table, and it is evidently that of a powerful adult:—

Large ♂ Killer, and Reinhardt's *Pseudorca crassidens*.

	♂. inches.	Reinhardt's 21 ft.	
		ft.	ins.
Length of head from occipital condyle to tip of snout .....	38 $\frac{1}{2}$	3	6
Length of head from inferior margin of occipital process to fissure between condyles .....	36		
Length of cranial portion from occipital condyles to front wall of nasal canals .....	11		
(This is an uncertain measurement, as no definition in front and no mention of prominence on base of occipital condyles.)			
Length of beak from origin on level with anterior extremity of zygomatic .....	19		
Greatest breadth of skull (across zygomatic process of temporal bone) .....	23 $\frac{1}{2}$ abt. (broken)		
Breadth of skull across postorbital process in front .....	22 $\frac{1}{2}$ abt.		
Breadth of occipital ridge at union with temporal ridge .....	14 $\frac{1}{2}$ abt.		
Breadth across prominences formed by the frontal, the superior maxillary, and the zygomatic in front of orbit .....	21 abt. (left prominence broken)		
Breadth of beak at origin .....	13 $\frac{1}{2}$		
„ „ towards middle, third lateral tooth .....	12		
Height of occipital foramen (at its narrowest part) .....	2 $\frac{1}{2}$		
Breadth of occipital foramen .....	2 $\frac{1}{2}$		
Distance from inferior margin of occipital foramen to posterior margin of pterygoid bones .....	13		
Length of dental row in upper jaw .....	15 $\frac{1}{2}$	1	2 $\frac{1}{2}$
„ mandible from condyle to tip .....	31 $\frac{5}{8}$	2	8 $\frac{1}{2}$
„ symphysis .....	6 $\frac{7}{8}$		
„ dental row in mandible .....	15 $\frac{1}{2}$		
Height of skull from base of occipital to parietal crest .....	15 $\frac{1}{4}$ abt.		

In viewing it from above and in front it is obviously more symmetrical than that of *Globiocephalus*, the nostrils having only a slight slope to the left, whereas in *Globiocephalus* the slope is pronounced. Moreover, the nostrils are nearly vertical, whilst those of *Globiocephalus* slope boldly upward and backward. The nasals were elongated transversely and in this case narrow, the right larger than the left, and an internasal process of the frontal separated them. In *Globiocephalus* this process does not always reach the front, and there is variety also in *Orea*. The premaxillaries of *Orea* are scoop-shaped superiorly, and their long narrow outline, with a

constriction about the middle, is in contrast with the broad plates of *Globiocephalus*, which leave only a narrow margin of the maxilla externally.

In *Orca* a large part of the maxilla is free (one of Reinhardt's specific characters), the contour is more uniform and symmetrical, the maxilla comes nearly as far forwards as the median process of the premaxilla, and its tip is bifid. The prominences of the maxillæ (with zygomatic process and frontals) above the eyes are roughened, but less than in the very old female. A marked feature of the skull in contrast with its allies is the great size of the temporal fossa, which, as Reinhardt truly says, makes the skull of this species, in contrast with that of *Beluga* or even of *Globiocephalus*, akin to the contrast afforded by the skulls of the lion and the horse or ox. The powerful muscles which pass through this huge space are attached to the mandible, the mass in front of the condyles being very large.

The ventral aspect of the cranium is equally diagnostic when contrasted with *Globiocephalus*. Thus the vomer comes to the surface for  $3\frac{1}{4}$  inches, and the premaxillaries in front of it form part of the roof of the mouth for fully a foot (a character Reinhardt considers unusual in true Killers). In *Globiocephalus* the long vomer blocks the upper part of the median fissure of the palate in front, and the premaxillæ only occupy a small area of the palate at the tip of the snout. The arch of the palate in *Orca* slopes upward and inward to the median line, giving it a characteristic spout-shape when the skull is laid on its dorsum; whereas in *Globiocephalus* the palate, while it has the deep median fissure at the tip, is flattened, or shows a slight outward curve to the dentary edge, which is little more than half the length of that in *Orca*, though the hard palate is proportionally broader. The palatines in the two forms equally diverge, those in *Orca* forming a narrow lozenge fully 9 inches in length, whereas in *Globiocephalus* they have but a brief mesial course (about  $2\frac{1}{2}$  inches) posteriorly, and then curve outward like a V behind the maxilla. In the same way the pterygoids diverge, those in *Globiocephalus* are aided by the palatines in the formation of the large postpalatine air-sinuses, whereas in *Orca* these are proportionally smaller and are formed by the pterygoids. The jugal is comparatively slender, but considerably longer and stouter than in the old female.

The armature of the jaws in this specimen is formidable, for the teeth are massive, long, and slightly curved at the crown. The number of teeth in each jaw is 13, and their



solidity is noteworthy, the pulp-cavity being largely filled up, a small central canal in the massive dentine only being left. The general outline of the teeth approached a spindle, though the curve of the crown, especially in the maxillary teeth, interferes with the regularity of such a figure. Most of the teeth were flattened antero-posteriorly, and hard lines occurred at the margin of the gum. The longest teeth were found in the mandible, where the curvature of the crown was less, some reaching 5 inches with a maximum diameter of  $1\frac{3}{8}$  inches. The large curved maxillary teeth measured about  $4\frac{1}{2}$  inches with a diameter similar to those in the mandible. Almost all the teeth in this vigorous specimen had two facets, from friction of the teeth opposite, on the crown (one anterior, the other posterior), only one or two of the back teeth being free from such injury. Moreover, some had abrasions of the enamel on the summit as well as externally and internally, showing that hard substances as well as the opposite teeth were implicated in the abrasions. The site of the main facets (anterior and posterior) varied considerably, some of the anterior maxillary teeth had the front facet near the gum, whilst the posterior facet was near the apex of the crown. In the mandibular teeth the large facet was generally in front, and the deep furrows showed the force with which the powerful muscles drove the teeth together. Eschricht thought that they were worn on the anterior and external sides in the maxilla, but in this case the facets were anterior and posterior, though it is true a few presented a large abraded surface externally. This character, therefore, is subject to variety. The foremost, a single small tooth, in the premaxillæ and mandible had fallen out, and the sockets were partially filled up. It had occupied the tip of each premaxilla, and another had been in the outer process of each maxilla. The formidable teeth of the Killer made a striking contrast with those of *Globiocephalus*, not only from their solidity and size, but from the length of the alveoli, viz.  $15\frac{1}{2}$  inches along the maxillæ and the same in the mandible, whereas even in a large *Globiocephalus* the rows of teeth cover but 7 inches in each case. Moreover, the broad anterior region of the hard palate with its curved rows of teeth is in contrast with the longer rows of teeth, which in the proportionally narrower hard palate of the Killer gently diverge from each other posteriorly.

In the mandible of *Orca* the symphysis slopes obliquely from the front backward, and the opposed surfaces, which are peculiarly smooth, are proportionally larger than in *Globiocephalus*, in which the symphysis is perfectly straight.

It thus happens that in *Orca* the long upper union is slightly hollow, whilst the lower is convex, it may be with a median groove.

The vertebral column, so far as the remnants exist, has the bodies of the vertebræ, especially in the lumbar region, somewhat larger than in the female, and the few ribs present are without traces of injury. The atlas and the three next vertebræ have both the spines and the bodies fused. Reinhardt places weight on the occurrence of a rudimentary transverse process on the axis of his *Pseudorca crassidens*, but in the Killers there is variation, for the male shows a much shorter process than the female. The only other bone available was the typically fan-shaped right scapula, which was somewhat larger than that of the female, the neck broader, and its muscular impressions more pronounced. It measured 14 inches from the dorsal margin to the edge of the glenoid cavity, and its extreme breadth was 19 inches. The abraded acromion was  $3\frac{1}{4}$  and the coracoid 4 inches long. In all respects it bears out Reinhardt's statement that the acromion is placed sufficiently far behind the anterior edge so as not to hide that part of the external surface which is placed before it, whereas in other cetaceans this surface is less easily seen.

Impelled by the great muscles, the flukes of the tail churn the water like the screw of a powerful steamer, and the rapacious cetacean rushes swiftly on either seal or porpoise, which in vain essays to escape by doubling or diving, for the broad and muscular flippers enable their pursuer to cope with every movement, and the relentless grasp of those ready jaws soon ends the chase. Moreover, the skins of the seals are, by muscular action and gastric juice, by and by removed from the carcass and ejected by the mouth, as Eschricht first noticed—those in the stomach being flayed, whilst a skin with hairs stuck in the mouth and throat. It would also appear (Nilsson and Eschricht) that the seals are often seized laterally, the grasp of the trenchant teeth taking in the parts between the occiput and the sternum. The skins having thus been removed, the soft parts and the bones are rapidly acted on in the stomach. Such forms as the Killers thus keep in check active fish-destroyers like porpoises and seals, for though fishes are occasionally found in their stomachs they appear to relish warm-blooded animals more. Moreover, their distribution is so wide that their influence is felt over a great area. It would be equally unreasonable,

however, to attribute the plenitude of the marine food-fishes to such influences as to place the onus of their diminution on the multitudes of piscivorous cetaceans and seals. The effects of both are important, but they do not in any way interfere with the balance of Nature in the ocean.

The density of the bones in the female *Orca* at once made it apparent that, irrespective of the condition of the teeth, the animal was very old. Hard steel instruments snapped when holes were drilled in the cranium, and its great weight still further corroborated its density. The supraocular tuberosities of the maxillaries and frontals were much more rough than in the male, from what may be termed papillary bony growths, and the same condition was present on the narrower part of the maxillaries in front of the constriction and notch; whilst even the hollows of the upper part of the premaxillaries were hirsute with bony points. The edge of the supraoccipital was roughened by sharp tubercles, and the same bone and the squamosal externally were similarly affected, as were also the edges of the body of the hyoid. Similar bony granules occurred on the tips of the neural spines and arches throughout, on the transverse processes in the dorsal region, and on the caudal vertebrae.

The skull was only about an inch shorter than that of the male, but its weight and density were proportionally greater. The twist of the nasal region to the left was somewhat more pronounced than in the male, and the great foramen in the maxillary above the eye was twice as large. No process of the frontal separated the nasals, which were twice as thick as in the male and firmly anchylosed.

The teeth, with the exception of two of the rear teeth in the maxilla, were all worn down to the gums, the row in each jaw being 14 inches in length, and the number of teeth in each row being 13. The polished abraded surface sloped from without inward in most, so that the outer line was slightly longer than the inner. The maxillary teeth were a little longer than the mandibular. Some showed a considerable opening into the pulp-cavity (that is, the latter had been enlarged), yet they were useful teeth and showed no sign of being shed. Such an animal, however, could not sever the parts in a seal with the ease of the male just described, though the two foremost small teeth in the mandible gave a certain hold. It may have found difficulty in capturing such forms for food, though it is more likely that it perished from extreme old age. The longevity of Killers is unknown, but it is certain that no marine animal is capable of preying



on them, whilst their distribution is cosmopolitan. This female may have been from 50 to 100 years old, but, of course, this statement is conjectural. So far as can be observed, the specific distinctions of Killers are in need of careful re-examination.

In this specimen there were 52 or possibly 53 vertebræ, and some of the caudal showed traces of age in the granular bony growths on their surfaces. The lumbar vertebræ were somewhat smaller than those of the male. Four of the cervical vertebræ were firmly fused (viz. atlas, axis, and the two following), then the spines of last three were fixed, and the centra of the 5th and 6th also, whilst the body of the 7th was free. Anchylosis in this old female had therefore advanced further than in the male. There are eleven pairs of ribs, but the transverse processes of the 12th dorsal vertebra had narrow facets, and as a small and slender rib accompanied the rest it is probable that twelve pairs existed. The 7th rib on the left had a callus (from fracture) about a foot from the transverse process, and the 9th, 10th, and 11th on the right showed the same feature, the callus on the 11th being largest. These ribs had been fractured by a powerful blow—perhaps from the tail of a large right whale or a rorqual which it had attacked during its long predatory career. The first rib was 12 inches long from the head to the articular surface for the massive costal bone, and the sternal articular end of the latter and the sternum itself were roughened by small bony excrescences. The sternum, originally of four pieces, formed a solid mass of bone without trace of aperture, thus differing from that of Reinhardt's *Pseudorca crassidens*, which likewise had a long first rib. A single pelvic bone, about 8 inches long, was preserved. It agreed with Reinhardt's description in being less curved than in the male. The scapula measured  $13\frac{1}{2}$  inches from the dorsal to the glenoid edge, and its extreme breadth was  $17\frac{1}{2}$  inches, thus being slightly less than that of the male. The humerus and the upper end of the radius and ulna showed the same granular rough surfaces, externally and internally, as were noticed elsewhere. This condition may have been partly due to age and partly to an arthritic affection, such as occasionally is found in the vertebral column of horses and other domestic animals. Ossification of the carpus was noteworthy.

The following measurements of this female are contrasted with those of a Killer of 21 feet (*Pseudorca crassidens*) given by Reinhardt :—



	♀.	Reinhardt's	
	inches.	21 ft.	in.
Length of nose from tip to nasal opening....	22 $\frac{1}{2}$	1	9
Width at base of nose at contraction in front of maxillary knobs .....	11	1	1 $\frac{1}{2}$
Length of scapula from glenoid cavity to upper opposite edge .....	13 $\frac{1}{2}$	1	10 $\frac{1}{2}$
Acromion (subquadrangular), length .....	4		4 $\frac{1}{2}$
" " " width .....	4		4
Coracoid process .....	3 $\frac{1}{4}$		3 $\frac{1}{2}$
Os humeri (tuberculum majus large) .....	8 $\frac{1}{2}$		10
Radius, length.....	8		11
" width, lower end .....	5 $\frac{1}{4}$		8
Ulna, length .....	8 $\frac{1}{6}$		9
" across olecranon, width .....	4 $\frac{1}{8}$		5
" at lower end, width.....	5 $\frac{1}{2}$		6 $\frac{1}{2}$

## 2. On the British Ammocharidæ.

The family of the Ammocharidæ forms a comparatively recent introduction into zoological literature, and yet its representatives, though few, are world-wide in their distribution. No mention is made of any species in Dr. Johnston's 'Catalogue of the Annelids in the British Museum,' though in 1842 Delle Chiaje had described and figured *Owenia fusiformis*, the common form on the British shores, and often tossed in hundreds on the West Sands of St. Andrews after storms.

The cephalic region of *Owenia fusiformis* varies a little in appearance when viewed antero-posteriorly in spirit-preparations; but in general it presents a truncated surface, having dorsally a rounded elevation the long diameter of which is transverse. Arnold Watson describes an aperture through a network of muscular fibres at the convex median part of this anterior lip, establishing communication between the cœlom and the exterior. Beneath this laterally are two lobes or lips, sometimes marked by an oblique groove slanting from above downward and inward, and having the mouth at their anterior border. A bilobed process (the "Lippen-organ" of Drasche) projects from the region behind, whilst inferiorly another rounded process occupies the furrow, which is finally bounded ventrally by the smooth border of the rim between the branchial processes. This edge of the cephalic rim slightly recedes in comparison with the dorsal, so that the surface does not form quite a right angle. In lateral view, indeed, the median ventral edge is spout-shaped, though it does not project much. An eye-spot

lies on each side, at the base of the branchial process beyond the edge of the spout-like curve.

The cephalic rim carries three pairs of dichotomously divided branchiæ, the basal regions being large and massive, the distal processes rather short and truncated. These organs have their inner surfaces covered with cilia in life. As Mr. Watson \* states: "Each has a wide, very flat base and 3 or 4 branches, which are subdivided into 7 or more twigs, each terminated by two small rounded mucus-secreting lobes. In British specimens the branched processes, viewed by transmitted light, are semitransparent, pale greenish blue, or yellow, and tinted with red; whilst those from Naples are blood-red and in parts coloured with a reddish-brown pigment." The Scotch specimens have a pale brown body, paler posteriorly, and the tentacles are brown. The branchiæ have only a notch between them dorsally, but ventrally a considerable interval occurs at the slightly spout-shaped region below the mouth. These organs are richly vascular. Claparède and Cunningham and Ramage suggest that they are merely outgrowths from the periphery of the mouth, and are not homologous with the branchiæ of the serpulids.

The dorsal lobe has, according to Mr. Arnold Watson, a pore leading into the prolongation of the cœlom, a condition exceptional in the Polychæta, though present in the Enchytræidæ.

Surrounding the circlet of branchiæ is a fold or collar of the body-wall, deepest dorsally, and becoming shallow at the ventral edge. A slight fold or notch occurs at each side with a groove running a short distance backward and nearly opposite the interval between the median and ventral branchiæ. A transverse patch of brown pigment marks the collar dorsally, passes by the eye-spot on each side, from which it slopes to meet its fellow of the opposite side in the mid-ventral line about the level of the first bristle-bundles. Drasche and Watson showed that this pigment indicates the position of the brain and œsophageal commissures, as they unite to form the ganglion from which the ventral cord, which is devoid of ganglia or neural canals, arises.

The *body* varies from 30–60 mm. in length, is firm and rounded anteriorly, somewhat flattened and tapered posteriorly, where it ends in a slightly bilobed tip with the anus in the centre—the condition perhaps being more accurately described as a papillose anus with a dimple in the centre dorsally and ventrally. The segments, which are indistinctly

\* Journ. Linn. Soc., Zool. vol. xxviii. p. 231.

defined, are from 23–30 in number, and vary remarkably in antero-posterior diameter. The first region of the body, which commences with the madder-brown collar, consists of the buccal and three bristled segments, as pointed out by Kölliker in 1864 and the author in 1869, and not of two as Grube, Claparède, and Lo Bianco supposed—the smaller posterior pair, dorsal in position, having been overlooked or, as Claparède states, represents the dorsal fascicle pertaining to the 1st pair of tori. These bristles have a fine pale golden lustre, and the row or tuft stands more or less vertically, the longest and most finely tapered being dorsal. All are simple tapering bristles and the pinnate spikes slant upward—that is, toward the tip. The first pair of bristle-bundles is lateral in position and is about equidistant between the collar and the second pair, with which it agrees in general arrangement. The third pair is not visible from the ventral surface, being dorsal in position, springs a little in front of the segment-junction, and is directed obliquely upward and outward. Its bristles have the same structure as those in front, but the function probably differs.

Dorsally the anterior region presents a long shield-shaped central area, the broad part of which is in front, and the sides outlined by two frilled bands which pass to the front of the 3rd segment. Ventrally immediately behind the mouth is a triangular area, specially alluded to by Mr. Arnold Watson, bounded by the line of the nerve-cords, which slant inward from each side to form the fused central band along this surface to the tail.

A septum divides the buccal from the following segment, but the three bristled segments form a single chamber. Each of the segments of the posterior region (that is, after the 3rd bristled segment) is separated from the adjoining one by a septum (Watson).

The œsophagus is about the length of the anterior region, and is followed by the intestine, which passes to the anus, a series of enlargements and constrictions occurring during its course. De St. Joseph describes the colour of the canal in the 3rd and 4th posterior segments as greenish from glands. The gut has a dorsal and a ventral mesentery and passes through the septa. It is surrounded by the dorsal blood-vessel throughout the greater part of its length, thus forming a peri-intestinal sinus (Watson). This bifurcates anteriorly near the branchial processes, bends downward and unites with its fellow to form the ventral vessel, which has numerous round ampullæ, as many as forty occurring in the 3rd posterior segment (De St. Joseph).

In section of the body-wall the cuticle is said to occur only on the anterior region, the epiderm alone being present posteriorly. Moreover, Gilson thought no cœlomic epithelium lined the muscles internally, a view opposed by Drasche and Ogneff \*.

There are six, sometimes seven †, pairs of cylindrical, rigid, thread-secreting glands of considerable size, which hang loosely in the body-cavity—a pair to each of the 1st and 2nd anterior segments, and the first four posterior segments. Each is attached to the body-wall by one extremity, which forms a duct opening between the end of the torus and the bundle of setæ of the segment to which it pertains (Watson). These secrete a thick viscous liquid containing fine colourless threads used in the formation of the inner lining of its tube. De St. Joseph found a minute distome fixed to one of the glands.

The septa, as pointed out by Gilson, have two valves, viz., a simple slit or flap-valve dorsally opening forward like a door and a sphincter valve ventrally. Watson noticed that the forward current passed through the dorsal valves, and the backward current of cœlomic fluid through the ventral. These valves are specially powerful in the septum separating the anterior from the posterior region.

The next three segments are comparatively long, each being about twice the length of the anterior region of three segments. The first of these (the 4th bristled segment) has two dorsal bristle-tufts immediately behind its anterior border, and two tori for hooks ventrally in the same line as the bristle-tufts. Two dorsal glandular bands pass laterally from the bristle-tufts to those of the succeeding segment, curving inward as they approach the latter. The ventral surface is marked only by the median band. The next two segments follow the same arrangement dorsally and ventrally. Watson describes an olive-green zigzag canal as running almost from end to end of the second segment of the posterior region, and this is the nephridium of Gilson, for it has an internal funnel-shaped opening and a slit-like aperture externally. He found, however, that it does not transmit the genital products as Gilson supposed. The seventh bristled segment is shorter, but it also presents the same glandular bands dorsally, the dorsal bristles in front of this

\* "Au-dessous de la cuticle, de l'hypoderme et de la couche des muscles circulaires qui n'existe que dans le thorax l'enveloppe du corps est tapissée d'une couche continue de muscles longitudinaux," etc.

† Gilson indicates a rudimentary gland in the 3rd anterior segment. It is sometimes absent.



segment and at its rear being nearer each other, and the posterior pair in front of the tori. The following, or 8th, bristled segment inaugurates a change, for it has no dorsal glandular bands, and posteriorly it is separated from the next segment by a deep furrow—in front of which are the tori, the edges of which are dorsal, and the bristles, which like those in front are near each other. Moreover, a couple of dimples occur anteriorly on each side of the middle line. Further, if it be held that the anterior segments have their tori and bristles in front, then this segment (8th) has a double series, those in rear being in front of the segment-junction, and the bristles slant upward and forward. The following segments bear the dorsal bristles on the outer edge and widely apart from each other, and the tori are ventral in position. The direction of the bristle-tufts after the 11th abdominal segment is usually in the preparations more or less transverse. Moreover, these posterior bristles, even to the tip of the tail, are lateral in position.

The segments gradually diminish in antero-posterior diameter towards the tail, which is terminated by a comparatively large anus with a papillose margin, a few of the minute segments adjoining it apparently having no bristles.

The bristles throughout have the same structure and are slightly pinnate at the extremity (Watson), those in the posterior segments being fewer in number and proportionally large and more slender. The tori form characteristic bands of a multitude of minute crotchets, forming a dense series, each with two well-marked terminal hooks, the posterior curve of which is prominent at the tip, the neck, which is narrowed, having a forward bulge anteriorly below the hooks, and with a shoulder as it joins the shaft, which is long and slightly tapered posteriorly to a delicate thread \*. The hooks of the specimens from St. Andrews are somewhat larger than those of the more bulky Annelids from Naples, but are precisely of the same structure, and thus differ from the somewhat abrupt posterior end at its junction with the ligament as shown by Arnold Watson, the figure having probably been foreshortened to suit the plate. All have a long shaft gradually tapering towards the base and a distinct shoulder grasped by the epiderm. The absence of a shoulder in the figure of Sars may have been due to the imperfection of his microscope. The tori of the first four segments are red from their

\* De St. Joseph calculates that there are about 7600 hooks *per torus*, and perhaps about 450,000 in all.

Johnson, in Puget Sound Annel., describes an *Ammochaeres* with bifid uncini.

vascularity (Watson), and the anterior ones almost meet in the central line ventrally, and reach as far as the bristles dorsally, so that they form the greater part of a ring.

The tube, which may vary from 3–10 cm. and 2 mm. or more in diameter, as a rule consists of a thick internal lining of secretion which in the middle presents a circular lumen in section, and of two conical, elastic, membranous ends—each with a minute aperture. The body of the tube is densely covered with fragments of shell more or less set on edge, and in the preparations generally sloped obliquely toward the anterior end of the tube. The method by which the annelid accomplishes this is graphically described by Arnold Watson.

3. *On Myriochele heeri* &c. dredged in the Gulf of  
*St. Lawrence, Canada, by Dr. Whiteaves.*

Dredged abundantly in the Gulf of St. Lawrence, Canada, Stations No. 9, 35, 36, 37, and 42, 1873.

The tube in some is nearly 4 inches in length, the anterior third being spindle-shaped and prolonged posteriorly into a narrow process, thus differing from the tube of *Owenia*. It is composed of sand-grains incorporated in a very tough secretion externally, and internally of layers of secretion, and to it the animal in the preserved condition clings so firmly that it is difficult to secure more than a fragment. The anterior end forms a conical process with a small aperture at the tip, but only the extreme tip is free from sand-grains. Posteriorly the long narrow tube ends in an aperture, and whilst the greater part of it is covered with the sand-grains in tough secretion, the terminal region, which is almost filiform, is coated with soft sandy mud, which often forms a mass at the tip. The external coating is composed of firmly agglutinated mud in which large sand-grains are imbedded, and occasionally a few tufts of *Gemellaria* are attached near the anterior end, the larvæ having settled and grown thereon. In many the wrinkles and the grains are transversely arranged on the anterior or larger portion of the tube, the long slender posterior end not showing this condition. In those with shorter tubes the sand-grains, on the other hand, go to the posterior end.

A few tubes are formed of white sand-grains with black interspersed.

Tubes from Norway apparently belonging to this species were bristled with sponge-spicules.

The head and the buccal segment are often somewhat en-

larged in lateral view, whilst from the dorsum they form a bluntly clavate process with a constriction behind. In others this region slightly projects all round. The mouth opens as a large circular aperture immediately behind the tip of the snout on the ventral surface, and it slopes to a peak ventrally. The oral margin is smoothly rounded.

The *body*, as far as was observed, for no entire example has been seen, has about 27 segments (Malmgren), divided into an anterior and a posterior region. The anterior region has three pairs of bristle-bundles, all visible at the sides of the body, and thus differs from *Owenia*, where the 3rd pair are dorsal. Each bristle is nearly straight and slightly tapered towards the tip, and has short spikes directed distally.

The succeeding region has both bristles and tori. The former agree with those in front. The hooks have a posterior projection distally and are bifid. The front edge of the neck below is prominent, and the neck itself is short, for the shoulder soon appears, whilst the shaft is long and tapers to a filament.

Another small elongated tube was dredged abundantly in the Gulf of St. Lawrence at Stations 33, 34, and 37-40, 1873. It measures nearly three inches in length, though some are shorter. It is cylindrical throughout the greater part of its length, though slight enlargement is noticed before tapering to the anterior end. The posterior end is often flattened and very gradually diminished to a blunt open end.

The tube is composed of secretion coated with minute particles of sand, and showing in some a transverse or circular arrangement. The long slender posterior end is often filled with faecal matter, chiefly mud and sand-grains.

The head in the preparations, as removed from the tubes, is truncated, with a rim, sometimes frilled, round the edge, and slanting backward ventrally to a deep notch. The compression of the blunt snout by the tube probably causes this condition. The rim appears to be ciliated. The mouth is subterminal as in allied species. Occasionally the head and buccal segment form an enlarged region with the sucker-like mouth anteriorly, the edges of the rim sloping to the ventral groove. As a transparent object a double loop of blood-vessels occurs behind the buccal segment, apparently from the dorsal vessel splitting to form the ventral.

The body is small, elongated, rounded, and appears to be from an inch to an inch and a half in length, abruptly truncated anteriorly, continuing nearly of the same diameter for a considerable distance and then tapering to the tail,

which is bilobed. The first region of the body consists of three bristled segments, the bristles of which are visible in lateral view. It seems to be rather less than the cephalic and buccal region in antero-posterior diameter, the bristles follow each other closely in dorso-ventral views, and are minute simple tapering forms with scarcely visible and thinly distributed spikes on their tips. As in the other members of the family no hooks occur in the anterior division, which is marked by a slightly constricted region having an antero-posterior diameter equal to the distance between two of the anterior pairs of bristles. A slight ventral swelling behind this indicates the tori of the next segment, which is rather longer than both the regions above mentioned. A tuft of bristles is situated on each side dorsally, and they have the same structure as those already mentioned. Considerable hypodermic glandular tissue appears on each side in the line of the bristles and runs backward to the end of the segment, indicating that in all probability a similar, though perhaps less developed, arrangement occurs in this as in the larger allies. Lateral and ventral elevations mark the commencement of the next segment, which is nearly double the length of the former. Traces of glandular bands appear on the dorsum of this segment also, and a bristle-tuft at each side of the dorsum in front; the following two segments (3rd and 4th of the second region) are nearly equal in length, each having its tori and bristle-tufts in front.

The number of segments intervening between the fore-going and the tail is uncertain.

The body becomes a little more flattened towards the tail, the segments gradually diminish in length, as also do the tori, whilst the bristles, though fewer, considerably increase in length. The last pair of bristle-bundles is accompanied by only a few hooks. In a reproduced tail the end is bilobed, the anus being in the centre. Moreover, behind the last bristle-bundle are a few hooks, which show that these organs appear before the bristles. A single bristle occurred in the last bristled segment on one side and three on the other, the 4th bristles from the end are very long, and so with those on several segments in front of it.

The crochets are exceedingly minute, but apparently have a similar structure to those already described, viz., a well-marked double hook at the tip, the posterior curve of the hook projecting beyond the neck, whilst the latter immediately below the hook in front is carried well forward. The neck is short and the shoulder slight, the shaft there-



after gradually tapering to a long filament or tendon moved by a muscular process. The vast number of these organs on a torus of the middle region of the body with their tendons and muscular apparatus gives an idea of the complexity of the arrangements for fixing the animal to the lining of its tube. Further investigation of this form is necessary, though it may be a variety of the foregoing.

A *Myriochele* was found at St. Andrews in the stomach of the haddock in 1864 by E. M., invested by a sandy tube. So far as can be observed in the fragmentary specimens, the arrangement of the bristles and the structure of the bifid hooks is identical. The size of the bifid hooks is somewhat larger than in the Canadian form described in the preceding note.

#### 4. On the British *Hermellidæ*.

In the 'Catalogue of the British Museum' by Dr. Johnston, three species are described under the Family Sabellariadæ, but two of these, viz., *Sabellaria anglica* and *S. crassissima* really pertain to the same form, *S. alveolata*, L., and the third is *S. spinulosa* of Leuckart, under the name of *S. lumbricalis*. The family is a small one, only two species being entered, for instance, by Mahngren in his northern list, and the same number characterized the British seas until Dr. Allen\* recently added to science the interesting *Pallasia murata* of the southern waters. English estuaries have masses of the sandy tubes of *S. alveolata*, whilst between tide-marks on Scottish coasts *A. spinulosa* forms dense groups of tubes on stones and rocks.

The cephalic region in *Sabellaria spinulosa* is divided dorsally into two great lateral lobes bearing the palæ on pillars, the dorsal edge of the mouth being in the centre, whilst the lips slope obliquely backward ventrally; the two lobes, which appear to be homologous with the operculum of the Serpulidæ, can be widely separated ventrally, where they merge into the mouth and its tentacles. Each lobe forms a semicircle which by apposition with its neighbour constitutes the opercular crown on the dorsal arch of the mouth, and between the tentacles is a tongue-shaped fold or process—richly ciliated.

The external series of golden palæ which form a fringe to the crown are about twenty-five in number; the typical palæ having a shaft, which tapers from the junction of the tip to the pointed base. The tip forms a broad, flattened,

\* Journ. M. B. A. vol. vii. p. 299, pl. x.

and somewhat spatulate process, one side of which bulges more than the other immediately on expanding above the shaft, whilst the tip is symmetrically narrowed to a blunt point, which is cut into three spikes on each side, the centre being produced as a long process with three lateral spikes directed distally. In the examples from Luccomb Chine, Isle of Wight, these lateral spikes are smaller and more numerous, and the process is larger. Striae cross the flattened tip from side to side, and are slightly curved upward at each end, the bulged base of the tip often showing a differentiation of these and a more marked curvature. The palæ at the extreme ends dorsally and ventrally are less neatly formed than those in the centre of the semicircle, the inner lateral spikes being long and powerful, whilst the central elongated process is more or less rudimentary. All, however, have the asymmetrical base as in the other types of the second and third rows.

The second row consists of modified bristles with a slender shaft tapering to a point at its base, and of a proportionally massive tip shaped like a broad bill-hook. The shaft tapers from its upper end to its pointed base and is comparatively slender. It curves posteriorly into the convex margin of the tip, whilst anteriorly it abruptly expands into a thin edge, which is concave in its progress to the pointed tip. Moreover, a second outline occurs within the foregoing, so as to simulate a double edge, as if a trace of a double wing were present. The thin edge beyond the inner line is boldly striated transversely throughout, and curved transverse striae cross the greater part of the tip, but not the base.

A considerable number of the bristles in this (second) row present a further stage in the modification of the tip, which forms a long, curved, tapering structure with the double outline on the anterior face and the transverse striae throughout the greater part of its extent. The two ridges on the anterior face are evidently modifications of wings, and the point is acute. The shaft is long and tapers from the upper part to a point at the base, whilst the posterior curve comes off distally before the anterior and is less abrupt. The anterior outline swells into the "heel" of the tip and is specially striated. In the St. Andrews forms these chiefly occur at the ventral edge. In those from Luccomb Chine, Isle of Wight, they occur all along the second or middle series.

In the variety *ensifera* from Lochmaddy and Guernsey several of the palæ of the second row form long needle-like processes projecting far beyond the rest, and giving a

character to the crown. Such occur in the young as well as in the adults from both places.

The third or inner row has another modification, the tip leaving the thin shaft at an angle greater than a right angle, and resembling a long foot with a pointed toe, the resemblance being the closer since the heel and foot have a different axis from the shaft. The shaft is proportionally the most slender, and the bending of the tip backwards causes the heel (anterior projection) to stand out prominently. Bold transverse striae occur on the face between the ridges, so as to make a rasp-like surface to which mud adheres. Finer striae are found on the heel and on the tip apart from the ridges. These bristles form a spiny guard to the oral aperture, and are often covered with muddy debris.

The crown is supported on a firm fleshy pillar, slightly bifid dorsally, and more distinctly so ventrally, its surface dorsally and laterally being variegated with purplish or madder brown—often arranged in bands dorsally and at the sides of the tentacles ventrally. A circle of acute tapering papillae pointing forward surrounds the base of the crown, and a brown pigment-band passes from the sides ventrally to the fissure.

Amidst the palæ of two specimens from Southport are numerous examples of a parasite akin to *Udonella*.

In the Scottish forms variations in the length of the tips of the second row of palæ are not uncommon, two or more of these on each side occasionally forming conspicuous golden curved needles which project far beyond the others. A curious variety was found in its tube attached to *Cellepora* off St. Peter Port, Guernsey, in which the external palæ had the distal central process reduced, so that at most it is only bifid or rarely trifid. The blade is short and broad. The bill-hook series of the second row is also broader and shorter than normal, but the inner palæ (third series) do not materially differ. This form shows that the palæ are hollow, formed of two thin plates of a somewhat brittle chitinoid substance.

On separating the lobes of the crown the mouth opens in the centre, and it is marked by the same madder-brown pigment, sometimes showing longitudinal stripes on its dorsal edge. It forms a large antero-posterior opening ventrally, the extended sides of which bear six series of purplish tentacles, whilst posteriorly a deep groove lies between a smooth fold on each side. Each series of tentacles springs from a base, as if formed of a transversely folded sheet of tissue on each side, the purplish-brown pigment



penetrating between the folds and rendering them more distinct. The folds are directed obliquely outward and forward, two on the pillars of the crown being more nearly longitudinal than the others, and, besides, a patch of tentacles closely abutting on the fissure lies to the inner side of these.

The tentacles are long and nearly cylindrical filaments which in life often twist and wriggle about. When stretched out they become attenuate, and distinct crenations directed toward the tip occur on their ciliated edges, giving the organ a transversely streaked aspect. Each contains two vessels, apparently a single trunk bent upon itself at the tip, the trunks looping together at the bases of the tentacles. The fluid in these vessels is perfectly translucent and free from granules. The matrix of the process is granular and pale (hypodermic), and seems to keep the vessels from undue pressure, yet retaining sufficient elasticity. Muscular fibres, both longitudinal and circular, are also present, but the latter were not distinctly seen. Under a power of 60 diameters the cilia of these organs are often seen to remain perfectly still—projecting from the sides like minute glassy spikes, then they suddenly are adpressed, the points directed toward the tip of the tentacle. Occasionally they are jerked in various ways—some vibrating rapidly a few times and again becoming rigid. In the quiescent condition they bear some resemblance to the spinous ray of a starfish or to some spine-clad stems like *Gleditschia*. The tip of the tentacle is more opaque than the rest, from its granules and gland-cells, and now and then it assumes a clavate outline, and in the preparations a few show a slight constriction below the tip.

On each side of the posterior groove of the mouth with its glandular folds is a bifid process, the anterior rounded portion of which is applied to the soft external fold of the mouth, whilst the pointed and somewhat ligulate process projects, like a ventral branchia, downward and slightly forward. These organs probably act in conjunction with the posterior buccal groove in tube-formation.

The body is somewhat flattened, marked dorsally and ventrally by a red streak. The cuticle is delicate and iridescent dorsally between the branchiæ, and is ciliated especially over the sites of the blood-vessels. The dorsal groove over the buccal region is also ciliated. On the ventral surface opposite the 2nd and 3rd segments is a smooth ovoid area clearly differentiated from the surrounding parts by an elevated border.



The firm cylindrical region, which splits in front to form the two pillars of the crown, has at its posterior border several processes, which apparently pertain to the next segment.

Dorsally is a pair of branchiæ of the normal shape, and from this a fold passes ventrally on each side, a space, however, intervening between it and the outer limb of the bifid postoral process. At the end of this ridge is a broad, flattened, pointed lobe or papilla, and sometimes two occur. Such would appear to indicate the first foot of the anterior or thoracic region of the body, more especially as on each side of the mid-dorsal groove a tuft of three long simple bristles with striated shafts and translucent tapered tips imbedded in the tissues passes forward to the anterior crown. The inner bristle on each side forms a pair with its neighbour and the tips are slightly incurved toward each other, the second and third (outer) are smaller. These bristles pass forward in a nearly parallel manner, only very slightly widening in front. The most interesting feature, however, is the occurrence to the exterior of these, also imbedded in the tissues, of several types of the modified bristles in the paleal crown. Thus the slipper-shaped kind with the shaft coming off at an angle, the form resembling a broad and short bill-hook, and the broad paddle-like external paleæ with the lateral spikes and special central process are each represented on one side or the other.

The anterior ("thoracic") region of the body includes three segments with transversely elongated lamellæ, each, moreover, having a pair of flattened ligulate crenate branchiæ which taper to a point and somewhat resemble the horns of a goat or antelope, from their transverse ridges, the large cilia of which have a bold hook-like curve directed toward the tip of the organ. The branchiæ are supplied with long powerful cilia on their ridges, which make a vortex in the water around them, and thus are in marked contrast to the delicately ciliated tentacles. Two vessels occur at their base, apparently afferent and efferent, and between these are a series of parallel transverse branches. They are less sensitive than the pale purple tentacles, since a more violent contraction takes place when the latter are touched with a needle. The first, viz., that in front of the anterior region proper, is a rather broad tongue-shaped process, shorter than the succeeding, which are elongated horn-shaped organs, the 6th apparently being the longest. They continue to the posterior end, but gradually diminish in size.

Each of the three prominent lateral lamellæ below the

branchiae carries a series of spatulate golden bristles arranged in a single line, the first having 7 or 8, the second 9, and the third 10. They are generally directed straight outward, though in life the points are directed backward, and have a flattened translucent tip like the blade of a paddle, the upper end of the shaft gradually dilating into the broad blade; the dilated part, moreover, showing in some short oblique striæ on one side—as if a trace of the striæ so common in winged forms. Those of the first set have a narrower tip and longer fringes; the outer fringes, moreover, being split into finer processes on the margin. Those of the third series have broader tips and the brush-like filaments at the extremity are shorter. Each bristle diminishes in size from the tip to the base, and the shaft is striated. Mingled with the foregoing bristles are a few simple forms, the curved slender tapering tips of which with their sparse spikes project from the skin between the stronger forms. If anything, the first series has slightly narrower tips and more slender shafts than the third, which sometimes shows truncated tips from wear.

A fold, marked by the purple-brown pigment from each of the dorsal setigerous lamellæ, continues the segment ventrally and ends in a papilla with a minute tuft of golden bristles, which, although small, have a similar structure to the larger. They are translucent bristles with long shafts deeply inserted in the tissues, the dilatation of the shaft distally being more gradual, whilst the fringes at the tip of the blade pass much more deeply, so that the whole tip forms a more perfect brush. They are also accompanied by the simple spinous bristles, which are considerably shorter, but go more deeply into the tissues. The physiological importance of the two sets of bristles is unknown, but it may be conjectured that the oar-shaped forms, having performed their functions of fashioning the tube, could be slightly retracted, or the slender ones may be slightly protracted, so that both might act in a brush-like manner. The anterior tuft is the largest and the 3rd the smallest; the opposite condition occurring in the large dorsal bristles. The direction of these bristles is forward and slightly inward, the angle of inclination being thus different from that in the next series. The last (3rd) set shows faint serrations or striæ at the sides just below the flat tip.

Between the ventral edge of the lamella for the hooks and the ventral bristles in the second (abdominal) region of the body is a small filiform papilla, longest in front and diminishing to a minute process in the caudal region.

The succeeding region of the body is characterized by the increase in the depth of the lateral lamellæ, the first being about three times that of the next in front; but they gradually diminish in depth in their progress backward, whilst they increase in prominence, those in the distal part of the region, for no dorsal bristles are visible, projecting like cirri. The bristles of the region are thus pushed ventrally, so that even the long posterior forms are not, as a rule, seen at the sides in a dorso-ventral view. They are situated to the inner side of the prominent, coloured, lamellæ forming the dorsal region of each segment. The longest bristles in each tuft are in front, since, instead of being arranged in a transverse row, they form an oblique one. The typical bristles are long and translucent with smooth shafts, which taper from the skin to the delicate and flexible tip covered with whorls of spikes directed distally. Their usual direction is forward and inward, and they fall smoothly under a needle, carried from behind forward, but rise against it when passed in the opposite direction. As rudimentary bristles of the same kind appear in the first region of the body between the bases of the spathulate forms, their distribution is thus uniform throughout. Moreover, the bristles of the first series of this region present a transition-stage, having stouter shafts and a broader and shorter spinous part at the tip, the latter, indeed, resembling a short villous region. Accompanying these is usually a slender tapering spinous bristle, and this is also a transition-form. The posterior bristles form a conspicuous series ventrally, but, though longer, their structure remains the same.

The prominent transverse or lateral lamellæ formerly alluded to bear the numerous hooks, their tendons, and muscles. In shape the hooks are elongate, with a single tendon at the distal end and two at the rounded base. In lateral view five teeth usually characterize them, though when viewed from the front each represents only one of two or three in the row of which six may occur in both anterior and posterior feet, the latter, however, having smaller hooks. The slender cirriform lamellæ of the posterior feet have the interior largely occupied by the bundles of tendons from the hooks, and to these muscular fibres are attached. At the base of each elongated lamella posteriorly is a deep brownish pigment-spot.

The narrow posterior end of the body is continued as a long tubular process, which fits into the dorsal groove when the animal is quiescent in the tube, but which can be elongated or shortened at will, and forms a very efficient



means for passing the faecal matter out of the aperture of the tube without necessitating the turning of the annelid. At its tip is the vent with a more or less distinct rim which in some is oblique. It is noteworthy that in the preparations this tube is generally dorsal, whereas that of *S. alveolata* is doubled forward in the ventral groove.

The next species, *Sabellaria alveolata*, L., has a cephalic region which differs from that of *S. spinulosa* in the more beautifully regular arrangement of the paleæ of the crown, and in the greater development of the filiform papillæ which form a graceful margin to it, and are even seen through its translucent marginal paleæ. Moreover, the shortness of the firm buccal region posteriorly distinguishes it from *S. spinulosa*. The sloping inner row of paleæ guard an elliptical central space, at the anterior end of which are the frilled dorsal margins of the mouth. The crown is supported on two short and massive pillars, but they are connate at the dorsal margin, the only differentiation being a gap in the circle of papillæ and the central line separating the posterior paleæ. Looked at from the face, however, a slight incurvation of the margin is observed dorsally and a more distinct one ventrally, where the split between the pillars supporting the crown is very distinct. In this species the marginal papillæ surrounding the crown are larger, longer, and more numerous than in *S. spinulosa*, and are very conspicuous whether viewed from front or rear.

The outer paleæ form a pale golden, translucent, and regular margin to the crown, lying almost horizontally, or with a slight slope upward, and presenting a finely notched continuous edge under a lens. Each palea is shaped somewhat like a cricket-bat with a long tapering handle and unequal shoulders, the translucent and flattened blade being slightly bent at the tip and generally split into five or six strong curved teeth directed to the front, or that side of the blade with the higher shoulder and slight concavity in outline. The second tooth, which occupies nearly the middle of the blade, is longest, and is followed by three or four smaller. The blade is marked by transverse striæ, which are finest on the translucent tip, and a kind of keel occurs near the higher shoulder, for the shaft is more or less rounded or angular, whilst the blade is flattened. The blades at the dorsal edge are a little longer, and their tips show less friction. The middle paleæ have slightly shorter blades, the tips of which are sometimes frayed, and the curve in front differs, in so far as a tendency to slope backward distally is noticeable. Those at the ventral edge show the latter



feature in a more pronounced manner, the tips are shorter, the teeth at the tip are longer, less curved, and show the effects of friction. The developing palæe in the tissues have the teeth connected by a membrane.

The second row, which is nearly horizontal, consists of palæe with an outline resembling a large heavy foot (the blade) and a slender tapering leg (the shaft), the heel being comparatively small. The double outline on the part representing the sole is less marked than in *Sabellaria spinulosa*, and this outline is nearly straight, the opposite one being slightly convex. Both slope a little toward the blunt tip, which is often frayed. The flattened tip is crossed by transverse striæ, and the tips of the blades touch the bases of the outer palæe and form a very regular second row, the two sides making an ovoid area.

The inner or third row of the pale golden palæe forms an oblique palisade, which leaves only a narrow ellipse between them, and in lateral view, in Neapolitan examples especially, the palisade shows a high dorsal margin and diminishes gradually to the ventral edge. The typical palæa has a long, flattened, tapering terminal blade, from which the shaft passes off at an oblique angle and tapers to a point, the heel or shoulder being at the front edge, the outline of which is very slightly concave, and with serrations on the margin. The dorsal outline presents a slight convexity in the region corresponding to the arch of the foot. The transverse or slightly oblique striæ pass from the inner outline to the free edge where the notches are. The rest of the tip is longitudinally striated.

The dorsal arch of the mouth is of a deep purplish-brown hue, and it passes backward till it meets with a buccal collar which joins its fellow of the opposite side ventrally in a slightly spout-shaped margin. From the dorsal edge of this collar springs a tapering buccal tentacle on each side. External to this collar ventrally another dark brownish-purple and frilled lamella, considerably thinner than the former, extends to meet that of the opposite side, so as to form another spout-shaped process—as it were, ensheathing the former, and connected externally with the inner base of the bifid organ which guards the spout-shaped aperture ventrally. The bifid organ springs by a broad base from the peristomial region, the massive and larger division curving inward to meet its fellow in front of the external spout-shaped aperture, the chink of which is observed between them. The anterior end of each is blunt and rounded, and the dorsal surface is tinted brownish. The other process springs about midway

from the outer edge, and passes forward and outward as a short conical process in the Neapolitan, but as a process with a longer filiform tip in the English examples, though its condition is subject to variation. Moreover, on a long papilla on the dorsal edge of the base (that is, behind the external pointed papilla), a row of fine bristles projects, the long axis of the tuft being from the front slightly upward and backward. In structure these bristles differ from the ventral series in being comparatively stout, perfectly smooth, and with the tips apparently abraded from use.

The oral tentacles form a series of converging rows on each side to the number of about twelve, but the number is variable. Each basal lamella is concave in front, and the filaments spring from the summit as a single row.

In spirit the buccal region still retains deep purplish-brown pigment on the sides, especially external to the tentacles and between their basal folds. It is terminated on each side posteriorly, as in *S. spinosa*, by a fillet which has a branchia dorsally and a flattened and pointed lamella with a minute bristle-tuft below it ventrally, the bristles having proportionally stout shafts and tapering closely spinous tips. They appear to belong to the ventral series.

The long dorsal bristles in the complex region of *Subellaria spinulosa* are thus absent, only developing paleæ occurring toward its anterior margin. Whether the smooth bristles to the exterior of the ventral mouth-lobes represent their equivalent or otherwise is at present unknown, but their absence dorsally is noteworthy. Meyer's view that such represents the dorsal division of the first segment of the body is thus not without basis, more especially as the tuft of characteristic bristles shows that the ventral division is also present. The dorsal bristles seem to be well developed in *Pallasia murata*, Allen \*, the first branchia with the fillet and the papilla on its anterior margin would thus appear to complete the parts of the first bristled segment.

The body is massive, rather flattened, grooved both dorsally and ventrally, gently tapered, both when viewed dorsally and laterally, from the anterior to the posterior end, and divided into two regions, besides the long, flexible, caudal tube which appears to be invariably curved ventrally in the preparations. The dorsum is occupied throughout by the branchiæ, the first three of which have broader flattened bases and more slender tips than the rest—which increase

\* Journ. M. B. A. iv. 8, vol. vii. p. 301, pl. x. figs. 1 & 3.

in length to the 7th or 8th, and then gradually diminish posteriorly. Their structure corresponds with that in *S. spinulosa*. The lateral region has the segment-ridges and the lamellæ for the hooks, the latter posteriorly projecting outward as long cuneiform processes. The dorsal surface is marked by close transverse striæ and an ovoid area about the 6th and 7th branchiæ. Ventrally the groove at the same level has a similar depressed ovoid area, and the caudal tube lies in the groove posteriorly, whilst anteriorly the groove commences behind the first (or thoracic) region.

Behind the fragmentary segment just described is the first region of the body proper (thoracic *auctorum*) consisting of three segments, each with a dorsal branchia and a lateral setigerous lamella, which increases in length and breadth from the first to the third. The first is least, and has slightly smaller oar-shaped bristles (7 in number), the pointed translucent tips of which are only a little fringed, and thus differ from those of *Sabellaria spinulosa* with their deep fissures. The second has a longer lamella than the first and a few bristles more, and the third exceeds both in these respects, and the bristles often show asymmetrical tips. The shafts of all these oar-shaped bristles are remarkably long, penetrating deeply into the tissues, and they also appear to be flat. Between each, as a rule, is a slender finely spinous form, only the tip of which projects from the surface, but it has a long straight shaft almost as large as that of the oar-shaped kind. The posterior margin of the first and second lamellæ are coarsely crenate, but that of the third is smooth; a ridge from each lamella passes downward to the ventral bristles.

The ventral bristles, as in the previous species, conform to the type of the dorsal, being more slender forms with oar-shaped tips.

The posterior region of the body has about 34 bristled segments, and tapers gently from the anterior to the posterior end, but the latter is of considerable breadth and is gently rounded to join the caudal tube. The dorsal surface is more or less flattened and marked by a rather broad median band with transverse grooves, which are not opposite those between the lateral lamellæ—indeed, they alternate with these. The ovoid anterior area is opposite the first, second, and part of the third segments of the region, whilst posteriorly the median band rises into an elevated rounded ridge, continuous with the caudal tube. The branchiæ form conspicuous dorsal processes, the first seven or eight being noteworthy for their great length. Their structure corresponds with that observed



in *S. spinulosa*. The ventral surface has a deep median groove, commencing with the first segment of the region and continuing to the last, for the reception of the caudal tube as it curves to this surface. Two transverse ridges cross the groove in front of the anterior area, the second being slightly bent forward, and the next (third) curved more boldly backward to suit the ovoid boss. As with the grooves on the dorsum, these transverse ridges are opposite the middle of each segment.

This region (second body-region) has no dorsal bristles. A ridge passes from each branchia laterally and ventrally, almost to the edge of the ventral groove. The upper third of the ridge is flat, then the torus for the uncini project and end ventrally in a papilla; lastly, the ridge is continued ventrally and ends in a process for the ventral bristle-tuft and a small subulate cirrus external to or behind it. The first has the longest and largest cirrus, and it is situated to the exterior of the bristle-tuft, and the next five or six, though less, are easily seen to the exterior of the bristles. By-and-by, in their progress backward, they diminish and fall to the rear of the bristle-tuft, and in the caudal region they form only flattened eminences behind the tufts. The first torus for the hooks is of great length, and so with the second, but the others gradually diminish, the last eight or nine being cirriform. The hooks are similar to those of *S. spinulosa*, presenting six teeth in lateral view, the basal end, however, is somewhat more truncate distally. Front views show at least a double series of teeth along the edge. Each has its distal and two proximal tendons, and the numbers are great, the tendons forming an asbestos-like mass of fibres in each case. The posterior hooks are smaller, but do not differ materially in outline.

The first bristle-tuft of the region is directed horizontally inward, and in structure it possesses intermediate characters, having about six or seven strong golden bristles with long flattened oar-shaped tips and elongated points, the surface of the tip being minutely spinous. There are, besides, about the same number of forms with more slender shafts and finely tapered tips, densely covered with minute whorls of spikes.

The second ventral tuft of pale golden bristles is directed inward and slightly forward, but it conforms to the ventral type of structure, some of the bristles having stouter longitudinally striated shafts, others more slender, but all having slender tapering tips clothed with whorls of spikes directed distally. The rest of the bristles of the region have their tips directed forward and inward, those in the caudal region



being even more conspicuous than those in front, and they have proportionally shorter tips and longer shafts, the imbricated spikes forming a scale-like arrangement on the front of the bristle, whilst the back is smooth. A more or less alternating series of stronger and more slender bristles occurs in each tuft, which is antero-posteriorly spread, like a fan, over the soft caudal tube in its ventral groove.

The caudal tube bends smoothly to the ventral groove, and extends more than halfway forward on the ventral surface, diminishing a little as it proceeds. A purplish-brown pigment-patch marks its commencement. Two ridges (probably muscular) occur on the ventral surface, with a median groove between them and a lateral furrow at each side. The anal aperture at the tip is usually ovoid in the preparations, with the long diameter transverse.

XIX.—*Observations on Coleoptera of the Family Buprestidæ, with Descriptions of new Species.* By CHAS. O. WATERHOUSE, I.S.O., F.E.S.

[Continued from vol. ix. 1912, p. 57.]

*Paracupta varennesi*, Montr.

The synonymy as given by Captain Kerremans in Wytsmann's 'Genera' and in his Monograph (iv. p. 143) is not quite correct. The species named *erythrocephala* in Capt. Kerremans' collection is *suturalis*, Saund., with three impressions on each elytron. The true *erythrocephala* has only one fovea at the base of the elytra (*vide* Montrouzier, Ann. Soc. Ent. Fr. viii. 1860, p. 249). The synonymy therefore should stand thus:—

1. *P. varennesi*, Montr.

2. *P. suturalis*, Saund.

*montrouzieri*, Th.

*erythrocephala*, Kerrem. (*nec* Montr.).

3. *P. erythrocephala*, Montr.

*mæsta*, Saund.

*Haplotrinchus viridula*, Ol.

By some unaccountable accident Capt. Kerremans had this species in his collection named "*cupreomaculata*, Saund.," and it appears under that name as the first species of the genus *Haplotrinchus* in Wytsman's 'Genera,' p. 127. The true *cupreomaculata* is a *Dicercomorpha* somewhat resembling *D. javanica*, but more finely sculptured and with bright coppery-red ornamentation.

*Chalcophora sexspinosa*, Th.

This species is a *Dicercomorpha* allied to *cupreomaculata*.

*Haplotrinchus splendens*, sp. n.

Head steel-blue, the vertex rich coppery red. Thorax rather strongly but not very closely punctured, dark steel-blue in front, bright metallic coppery red behind and at the sides. Scutellum rather broad, yellowish coppery, impressed in the middle. Elytra bright metallic green with gold reflections, shading into deep coppery red behind the middle, the apex steel-blue. The lines of punctures very slightly impressed, the interstices very finely punctured. The apex of each elytron with three teeth, the outer one prominent and very acute, the others small. Body beneath dark steel-blue, the tibiæ and tarsi ferruginous.

Length 15 mm.

*Hab.* Fiji Is. (September).

This species has somewhat the broad elliptical form of *H. aurocuprea* and *pyrochlora*, but it has no carina at the sides of the thorax and there are no impressions on the elytra.

*Dicercomorpha fasciata*, sp. n.

Dark steel-blue, the elytra with a purple shade. Resembles *D. mutabilis* in form. Head strongly rugosely punctured in front. Thorax strongly angulated at the sides, strongly punctured, the punctures not very close together on the disk, crowded at the sides. There is an oblique finely punctured impression in front, commencing at the anterior angle, slightly widening as it extends on to the disk; a short median impressed line in front; a rather deep, small, golden fovea in the middle of the base. Each elytron has the following well-marked, finely punctured, pale brassy white impressions:—A fascia at the base extending from the shoulder to near the scutellum; a transverse one below the shoulder,

with a small round one on the same level close to the suture ; a larger oval one on the disk behind these, with a very small one near it close to the suture ; a transverse one just behind these, touching the margin ; a fascia extending from the suture to the margin, interrupted by the second costa ; a subapical fascia which does not quite reach the suture. The sutural apical angle is not acute as in *mutabilis*, and the outer tooth is only very slightly prominent.

Length 19 mm.

*Hab.* Philippine Is. (*ex coll. D. Sharp*).

*Ectinogonia darwini*, sp. n.

Very broad. Head coppery, rugose, clothed with obscure yellowish pubescence. Thorax a little wider in front of the middle than at the posterior angles, which are not divergent, blackish green, densely and coarsely punctured, rugose at the sides ; median impression parallel-sided, the raised smooth parts have a few punctures, each with a rather broad bluish-green expansion near the front extending halfway to the anterior angle. Elytra densely and finely punctured, with larger punctures intermixed, the punctured parts coppery, the raised interspaces bluish green. The suture only slightly raised. Each elytron has three shining, strongly raised, smooth, nearly black costæ, broad at the base, gradually narrowed posteriorly, all meeting near the apex ; the third or outer one somewhat interrupted posteriorly. Each costa has several green punctured impressions. Between the third costa and the margin there is a fourth costa, beginning behind the middle and extending to the apex ; this has three or four coppery punctured impressions. The apex of each elytron is obliquely emarginate. Underside bright coppery, strongly punctured ; the middle of the prosternum bluish green. The margins of the abdominal segments shaded with golden green.

Length 32, lat. 14 mm.

*Hab.* — ?

The specimen described was in a box of miscellaneous S.-American insects collected by C. Darwin during the voyage of the 'Beagle.' It was standing by a label "from the Booby, St. Pauls," which referred to a species of *Onithomyia*, but it is very improbable that it came from that island. It is almost certainly from Chili.

*Stigmodera peroni*, Lap. & Gory.

The insect which bears this name in the Museum collection,

and which appears to be correctly determined, is the same as *Strigoptera australis* of Blackburn. It is placed in the genus *Neobuprestis* by Kerremans. It was originally described from Kangaroo Island, and two of the Museum specimens are from that locality. The male has the apical segment of the abdomen broadly emarginate, with the outer angles very acute.

XX.—On new Species of Indian Curculionidæ.—Part II.

By GUY A. K. MARSHALL.

THE following six new species of weevils were represented in a collection submitted to me for identification by Mr. E. P. Stebbing.

All the types are deposited in the British Museum.

*OTIORRHYNCHINÆ.*

*Mylocherus carinirostris*, sp. n.

Rufo-brunneus, insuper brunneo- subter pallide viridi-squamosus, prothorace lincis duabus viridibus ornato, elytris interstitiis alternis pallidioribus; rostro area dorsali elevata in frontem adscendente ibique abrupte truncata, areæ lateribus alte carinatis; funiculi articulo primo quam secundo longiore; prothorace subcylindrico, postice transverse impresso, basi bisinuato, apice rotundato-producto; elytris latis, longitudinaliter valde convexis, ad apicem truncatis, interstitiis setis squamiformibus confertim obsitis; femoribus unidentatis.

Colour black or chestnut-brown, with brown and green scaling; the sides and underparts pale metallic green; the prothorax dark brown above, with two narrow green stripes; the elytra indistinctly striped, the intervals 1, 3, and 5 being brown, the suture and alternate intervals rather paler and more or less irrorated with green scales, especially at the base of 2.

*Head* not continuous with the rostrum in a single plane, but with the elevated base of the latter continued on to the forehead, being broadly truncate at its base, and terminating abruptly so as to form a transverse furrow between the eyes; the latter widely separated and almost circular. *Rostrum* about as long as broad, longer than the head, somewhat dilated at the apex, the apical margin deeply and acutely incised, the raised dorsal area depressed in the middle,



without any central carina, but with the lateral carinæ elevated far above the upper margin of the eyes and forming an angular prominence above the insertion of the antennæ. *Antennæ* stout, the scape reaching the middle of the prothorax, with conspicuous curved setæ and brown and green scaling, the funicle with the basal joints elongate, 2 longer than 1, 3 slightly longer than 4, 2 to 6 with whitish scaling. *Prothorax* subcylindrical, the sides almost straight, the apex scarcely narrower than the base, the basal margin deeply bisinuate, the apical margin roundly prominent; when the scaling is intact the upper surface is closely covered with small punctures, each containing a short scale-like seta, and there is a shallow transverse impression behind the middle. *Elytra* comparatively broad, with the shoulders rather prominent, the sides slightly sinuate behind the shoulders and rounded posteriorly, being broadest behind the middle, the apices broadly truncate, the longitudinal curvature very convex, the striæ deep and distinctly punctate, the intervals convex and closely set with short, suberect, broad, scale-like setæ. *Legs* red-brown, with green and grey scaling, all the femora with a small tooth, the tibiæ simple.

Long.  $5\frac{1}{2}$ – $6\frac{1}{2}$ , lat.  $2\frac{5}{8}$ –3 mm.

ASSAM: Sylhet, Cachar; BURMA: Tharrawaddy (*E. P. Stebbing*).

In specimens which appear to be females of this species the rostral plate is rather narrower and its sides are distinctly sinuate and not strongly carinate. The presence of this rostral plate will distinguish this *Mylocerus* from every other described species.

*Mylocerus catechu*, sp. n.

Niger, squamulis viridibus metallicis dense vestitus, prothorace ad latera utrinque fusco-vittato; oculis lateralibus convexis, quam fronte multo angustioribus; rostro brevioris quam ad basin latioris, apice leviter rectangulariter exciso, carina media in frontem continuata; antennis ferrugineis, funiculi articulo primo quam secundo evidenter longiore et crassiore; prothorace subquadrato, lateribus parum rotundatis, basi subtruncato nec apice latiore; elytris setis minimis depressis indutis; femoribus unidentatis.

Colour black, with uniform pale metallic-green scaling, the prothorax with a lateral fuscous stripe on each side.

*Head* almost plane, the eyes lateral and rather prominent, the forehead much broader than the space between the scrobes. *Rostrum* a little longer than the head, shorter than its basal width, the sides narrowed from the base to beyond the middle

and dilated at the apex, the apical emargination comparatively shallow and forming a right angle, shallowly impressed above, and with a fine central carina which ascends the forehead, the lateral carinæ obsolete. *Antennæ* ferruginous, the funicle with joint 1 evidently longer and thicker than 2, the remaining joints subequal. *Prothorax* about as long as broad, the sides slightly rounded, broadest at the middle, very shallowly constricted and transversely impressed near the apex, the basal margin subtruncate and not broader than the apex, the sculpturing entirely concealed by the scaling. *Elytra* shallowly emarginate at the base, about twice as broad as the prothorax at the shoulders, the sides parallel, distinctly punctato-striate, the intervals slightly convex, the setæ very minute and depressed, only visible under a high magnification. *Legs* flavescent, the femora with green scaling and each with a minute tooth.

Long.  $2\frac{1}{8}$ – $2\frac{1}{2}$ , lat.  $\frac{7}{8}$ –1 mm.

BOMBAY: Poona (*E. P. Stebbing*).

Mr. Stebbing found this species feeding upon the leaves of *Acacia catechu*.

#### EREMNINÆ.

#### CYRTEPISTOMUS, gen. nov.

Type, *Phyllobius jucundus*, Redt.

Rostro non brevior quam latiore, genis plus minus dilatatis, margine epistomatis postico rotundato aut obtuse angulato, margine antico minus profunde exciso, scrobibus omnino apicalibus, foramine oris obliquo, mento setis quatuor transversim obsito; antennis elongatis, scapo cylindrico, gradatim clavato, funiculi articulo secundo quam primo non brevior; prothorace ad basin subtruncate aut perparum bisinuato, apice quam basi non aut vix angustiore, lobis ocularibus semper observandis, vibrissis brevibus; elytris, sterno, ventre, pedibus ut in genere *Cyphicero*, sed corbulis tibiarum posticarum sine carina interna (*necopino* et *pannoso* exceptis).

Allied to *Cyphicerus*, Schh., which differs principally in the following points:—The apical emargination of the rostrum is deep, and the posterior margin of the epistome forms a sharp angle, which is never less than a right angle; the funicle bears true scales and the second joint is longer than the first; the mentum bears only two setæ, and the corbels of the posterior tibiæ have always a distinct internal carina.

In addition to the type, the following described species are

referable to this genus:—*Cyphicerus deprecabilis*, Fst., *Corigetus gracilicornis*, Fst., *Corigetus necopinus*, Fst., and *Corigetus testatus*, Fst. The genus is so far known to occur in India, Burma, and China.

*Cyrtepestomus pannosus*, sp. n.

Piceus, parce brunneo-squamosus, fascia pallida indistincta post medium ornatus; fronte latissima in medio striata, oculis lateralibus fere planis; rostro in medio carinato; funiculi articulis 1 et 2 subæqualibus; prothorace transverso, lobis ocularibus distinctis subangulatis, rude punctato, antice transverse impresso, pone medium utrinque foveolato; elytris pone medium perparum dilatatis, squamulis elongato-oblongis et setis erectis obsitis.

Colour varying from pale brown to piceous black, with thin and uneven greyish scaling, often forming a very irregular transverse band behind the middle.

*Head* with the eyes lateral and almost flat, the forehead very broad and with a rather deep short central stria. *Rostrum* about as long as its basal width, strongly narrowed from the base to beyond the middle, thence dilated; the two carinæ flanking the dorsal area slightly diverging behind and with a longitudinal furrow adjoining each externally, the dorsal area plane and with a central carina lying in a furrow. *Antennæ* with joints 1 and 2 of the funicle subequal. *Prothorax* transverse, with the sides gently rounded, the base truncate, the dorsal front margin straight, the ocular lobes well developed, subangulate, and with indistinct vibrissæ; the dorsum coarsely punctate, with a shallow transverse anterior impression and a rounded fovea on each side behind the middle. *Elytra* subtruncate at the base, very slightly broadened behind the middle in both sexes, the striæ strongly punctate; the scales mostly elongate-oblong, a few subquadrate; the setæ cylindrical, rather long, and erect. *Legs* with the anterior tibiæ almost straight internally.

Long.  $4-5\frac{1}{4}$ , lat.  $1\frac{5}{8}-2\frac{1}{4}$  mm.

CENTRAL PROVINCES: Damoh, Jabalpur (*E. P. Stebbing*);  
BERAR: Melghat Forest (*Stebbing*).

Recorded as feeding on the leaves of teak.

*Amblyrrhinus subrecticollis*, sp. n.

Niger, squamulis brunneis et griseis variegatus, elytris postice plaga pallida ornatis; *A. poricollis* similis, sed rostro deflexo, lateribus subparallelis; prothorace subcylindrico et ad basin quam elytris multo angustiore; elytris setulis squamiformibus erectis obsitis.

Black, with dense grey scaling; the prothorax with a brown stripe on each side and a narrow brown central line; elytra variegated with brown dorsally and with a more distinct angulated brown marking behind the middle, followed by a broad pale oblique band.

*Rostrum* about as broad as long, almost parallel-sided and directed downwards, the raised dorsal area also parallel-sided and without any distinct anterior impression. *Prothorax* about as long as broad, much narrower than the elytra at the base, and only slightly narrowed in front, the sides being almost straight, the dorsal anterior margin subtruncate, the ocular lobes well developed; the upper surface with the sculpturing hidden by the scaling and set with very short suberect setæ. *Elytra* with distinct striæ, but with the punctures hidden by the scaling, the intervals convex and with rows of erect scale-like setæ.

Long. 5, lat.  $2\frac{1}{4}$  mm.

UNITED PROVINCES: Dehra Dun (*A. M. Littlewood*).

Mr. Stebbing states that the species was found in the rotting bark of *Mallotus philippinensis*.

In *A. poricollis*, Boh., the rostrum is porrect and narrowed in front, the prothorax is broadly dilated behind and the sides are angulated near the base, and the setæ on the elytra are recumbent and inconspicuous. Further, the scale-structure is quite distinct: in *A. subrecticollis* the scales are flake-like, flat or slightly concave, strongly fluted, and more or less regularly imbricated; whereas in *A. poricollis* they are somewhat bead-like, convex, indistinctly fluted, and scarcely overlapping.

#### ALCIDINÆ.

##### *Alcides porrectirostris*, sp. n.

Ater, nitidus, nudus; fronte fovea impressa; rostro porrecto, sat fortiter punctato; prothorace subconico, quam latitudine basali vix brevior, lateribus fere rectis, æqualiter granulato, antice rugoso; elytris prothorace multo latioribus, humeris prominentibus, lateribus subparallelis, seriatim fossulatis, subclathratis, interstitiis irregularibus rugosis; femoribus gracilibus, rugose punctatis, pilis longis infra indutis, dente acuto juxta apicem armatis, tibiis anticis intus unidentatis.

Black, shining, without scaling (three examples).

*Head* closely punctate, with a frontal fovea. *Rostrum* quite straight and porrect (especially in ♀), slightly widened apically, striolate at the base, strongly punctate in ♂, more finely in ♀. *Prothorax* subconical, about as long as its basal



width, the sides almost straight and with only a slight anterior constriction, the upper surface with rather distant low granules, the apical area rugose, the antescutellar angle slightly elevated. *Scutellum* oval, shallowly impressed. *Elytra* much broader than the prothorax, with the shoulders very prominent and roundly rectangular, the sides narrowing very slightly to beyond the middle, the longitudinal outline very convex and deepest before the middle, with regular rows of foveæ, the intervals being rather narrow, irregular, rugose, and sparsely set with very short, curved, pale setæ, the posterior calli prominent. *Legs* very coarsely punctate, the femora comparatively slender, with a fringe of long hairs beneath and with a long sharp tooth close to the apex; front tibiæ with a single internal tooth at the basal third.

Long. 8-9½, lat. 3¾-4 mm.

PUNJAB: Bashahr (*E. P. Stebbing*).

#### COSSONINÆ.

##### *Himatium asperum*, sp. n.

Rufo-brunneum, setosum; fronte evidentem confertim punctata; rostro omnino recto subcylindrico, a capite abruptius emisso, in medio dorsi subtilius punctato, alibi punctis majoribus subconfluentibus; prothorace subdepresso, undique reticulato-punctato, setis transversim reclinatis induto, prope basin latiore, lateribus vix rotundatis, antice profunde constricto; elytris late et profunde punctato-striatis, interstitiis omnibus setis reclinatis, alternis setis squamiformibus erectis obsitis.

Uniform red-brown, with stout pale setæ.

*Head* very convex and closely and distinctly punctate, the eyes scarcely visible from above. *Rostrum* about twice as long as broad, straight, parallel-sided, almost cylindrical, and projecting from the head at an angle with the forehead; for the most part with coarse and longitudinally confluent punctures, except in the centre of the disk, where the punctures are even finer than those on the head; with a few short scale-like setæ and a transverse row of four very long erect ones at the extreme base. *Prothorax* nearly half as long again as broad, widest near the base and gradually narrowed anteriorly, with a deep constriction near the apex; the upper surface rather flattened, with coarse reticulate punctation and long transversely recumbent setæ; the anterior margin laterally oblique and with a short, very dense, white fringe. *Elytra* somewhat flattened dorsally, with broad striæ containing large punctures, the intervals not broader than the

striae and each bearing a row of stout recumbent overlapping setae, the alternate intervals also with a row of erect scale-like setae.

Long.  $2\frac{1}{4}$ – $2\frac{1}{2}$ , lat.  $\frac{3}{4}$  mm.

ASSAM: Goalpara (*E. P. Stebbing*).

Found under the bark of a sal-tree (*Shorea robusta*).

Allied to *Himantium pubescens*, Woll., from Malabar, but that species differs *inter alia* in the following points:—The rostrum projects less abruptly from the head and is slightly curved, the punctation being equally coarse throughout; the head is extremely finely and sparsely punctate; the punctures on the prothorax are not reticulate, the interspaces being much broader than in *H. asperum*, and the sides of the prothorax are distinctly rounded; in the unique type the dorsum of the elytra is almost bare, but appears to have been abraded.

XXI.—*Observations on the Coloration of Echinus angulosus*, A. Agass. By J. STUART THOMSON, Ph.D., F.L.S., F.R.S.E., Lecturer in Vertebrate Zoology, Victoria University of Manchester.

IN 1904 F. Jeffrey Bell, in describing the Echinoderma found off the coast of South Africa, writes on the coloration of *Echinus angulosus*, A. Agass., as follows:—"The spines of this species appear to be pretty constantly either red or purple; the difference is so marked, and seems to be so equally divided among the specimens that it appears to me that it would be worth while to make observations on fresh specimens to see if it is due to differences of sex. I do not think this difference can be regarded as specific, notwithstanding Dr. Mortensen's statement that colour is an excellent guide for distinguishing the species of Echini."

This species, *Echinus angulosus*, occurs abundantly at various localities on the shore of and in shallow water off the South African coast. During a period of work at Cape Town I took the opportunity of noting the colours in a large number of living specimens of *Echinus angulosus*, and the first object of this short paper is to show that there are no facts to support the supposition that the coloration of this species may be regarded as a secondary sexual character.

A. Agassiz has described and figured *Echinus angulosus*, and he has also given a list of the synonyms and stated the

wide distribution of this species. Regarding the colour, Agassiz states that the longer and more slender spines generally have violet tips, and that the shafts have all shades between violet and the lightest yellow. Meissner has recorded *Echinus angulosus* from Cape Town, and writes that the colour of the spines of his specimens differed from those described by Agassiz in that they were a uniform brown throughout, while those of Agassiz's forms had coloured tips. Meissner, however, states that he was unable to state whether this was a colour variation, as he had no available notes on the coloration of living forms.

The specimens of *Echinus angulosus*, the colour variation of which I noted, were mainly collected from three littoral localities in False Bay and Table Bay; but I also examined specimens taken by the trawl in deeper water, viz. at a depth of 20 fathoms. *Echinus angulosus* occurs in great numbers in the rock-pools at low tides, and the species is of some slight economic value, as it is used as food by some of the numerous nationalities represented in Cape Colony. The species lends a bright colour to the pools in which it is found and can be noticed at some distance.

At Sea Point, to the west of Cape Town, the following varieties of colours among the specimens were noted:—Purple, 43 specimens; red, 7 specimens; green, 15 specimens; grey, 38 specimens; intermediate between purple and grey, 2 specimens; intermediate between green and purple, 3 specimens.

The species was seen to be sexually mature in May, and on examination the females were found to be purple, red, green, grey, intermediate between grey and purple, and intermediate between green and purple in colour. The males were purple or grey in colour. The females were more abundant than the males, only 10 to 20 per cent. being of the latter sex.

From the first locality at which examples were collected and examined it is thus evident that the sex of the specimens could not be identified by their colour.

On another occasion at Sea Point, the proportion of colours was as follows:—Purple, 8; green, 6; grey, 4; red, 1; intermediate between grey and purple, 1; intermediate between grey and green, 1; intermediate between green and brown, 1.

In the rock-pools at St. James's, in the vicinity of the Marine Biological Station, of seventeen specimens examined having a predominating red colour twelve were females and five males. The distribution of the colour of these specimens



was as follows:—The large spines were red for the greater part of their length, but with a green base; the smaller spines green, with reddish tips; the tube-feet reddish in colour; the test when deprived of spines and tube-feet grey. In specimens possessing a predominant purple colour the large spines were entirely purple, the smaller spines green with purple tips.

On a second occasion at the same locality, of twenty-four purple examples, the sexes were equally divided between the specimens, and the ovaries were chrome-yellow in colour, the testes lighter or darker. Of other specimens, the sex of which was noted, a red and a pink variety were females, and a pale mauve example was of the opposite sex.

Specimens from Kalk Bay, False Bay:—The specimens showed the following varieties of colour: red, lilac, grey, pink, pinkish green, greenish grey, intermediate between red and purple. On July 15th a lilac and a bluish-red specimen were mature, and the seminal fluid issuing from the genital plates was clearly observed. In the bluish specimen the testes were of an orange colour. Of three grey specimens, two were females and one male. The ovary was pale orange and the testis dark orange in colour. There is also a slight difference of texture between the testes and ovary. Of four lilac-coloured specimens three were males and one female. One pinkish-green specimen was female and another greenish-grey specimen was of the same sex.

It is thus again evident that colour afforded no means for the identification of the sex.

The opportunity was taken for noting the distribution of colour on individual examples:—

Red specimen: large spines red above, green at base; small spines mainly green, with a slight tinge of red; tube-feet a faint red, with alternate lighter and darker bands, and becoming darker at the tips. Red specimen of a darker red, affording some measure of transition to the purple forms; the large spines were mainly red on the upper part and green towards their bases; the tube-feet were apparently lighter than those of the last-mentioned specimen. In regard to the colour of the tube-feet generally, it seems that there is no great difference of colour, the apparent difference of colour being mainly due to reflection from the spines.

Lilac specimen: the large spines were lilac for the greater part of their length, becoming paler in colour near the base, and with the basal swelling greenish in colour. The small spines were lilac on their upper portions, greenish on their



lower halves. The tube-feet were approximately the same colour as those of the red specimens.

Grey specimen: the large spines were white or grey for about two-thirds of their length and greenish in colour for the lower one-third of their length. The small spines were for the greater part green, with a shorter white or grey portion and a minute pink tip. The tube-feet were apparently lighter than in the red or lilac specimens.

Pinkish-green specimen: the large spines were pink for two-thirds of the way down, the basal third was green, the basal swelling of the same colour. The small spines were pink on the upper third and green on the lower two-thirds.

Pink specimen: the large spines were mainly pink, but brownish at the tip and green at the base. The small spines were green for the greater part of their length, but pink near the tip.

Specimen intermediate between red and blue: the large spines were bluish in their upper portions, but quite red in their lower portion, and with a green basal peduncle. The small spines were blue in their upper portions, but green in their lower parts. The tube-feet were very similar in colour to those of the other specimens.

Greenish-grey specimen: the large spines were greenish below, but grey in their upper parts; the small spines greenish. Lilac specimen, the large spines were lilac on the upper portion, pale lilac below, and green at the base. The small spines were lilac in the upper and larger portion, green in the lower portion.

In all specimens—blue, red, lilac, &c.—the spines seem to be paler in colour round the mouth. The specimens frequently had shells &c. attached to them.

From the foregoing notes on the coloration of this species it is obvious that *Echinus angulosus* cannot be regarded as a sexually dimorphic form so far as its colour is concerned.

Extraneous coloration was illustrated in one specimen, part of which was of a green colour. This was due to the growth of a multicellular alga on one of the interambulacral areas which was devoid of large spines from the madreporic area to halfway down towards the mouth. The adjoining ambulacral area, between the rows of tube-feet, was also commencing to be infested by the attacks of the alga.

In the circumstances under which I worked in South Africa I had no chemical or physiological appliances, and thus am not in a position to make any very definite statements regarding the nature of the pigments; but brief

notes in regard to the solubility of the pigments may be added. On adding fresh water to a mixture of the spines and tube-feet of *Echinus angulosus*, the following results appeared almost immediately:—Green produced a pink solution; grey, pink solution (very similar to that of the perivisceral fluid); red, very slightly tinted pink solution; purple, slower appearance of a pink solution. The perivisceral fluid is pink at first, but becomes darker on exposure. The following solutions were obtained after the spines and tube-feet had been allowed to remain in the water for fourteen days:—Green, yellowish-green solution; grey, similar to that of green; red, slightly pink; purple, brownish to purple; the solutions having a disagreeable odour.

Effect of reagents on the spines (apart from the tube-feet): solutions of the following colours were obtained:—

Ether: red spines, yellow solution; light pink, yellow; lilac, very faintly tinted solution.

Ammonium chloride: red spines, a pink solution at first, which becomes darker, and is after two days a reddish brown.

Glycerine: red spines, a red solution quickly obtained; purple spines, a slightly tinted purple solution; in the case of the red spines the solutions became much intensified in colour on longer solution, but this was only extremely slightly the case with the purple.

Caustic potash: on red spines practically no result at first, later a yellowish-red to red solution.

As a whole, one may say that the colours of the spines are very unstable and are slightly soluble in such reagents as glycerine, ether, ammonium chloride, and perhaps caustic potash.

In regard to the meaning of the coloration of the Echinoderma there may be great diversity of opinion. The custom of propounding ingenious explanations as to the meaning of colour from the utilitarian standpoint is too prevalent. In regard to the species *Echinus angulosus*, one explanation of the colour must be at once excluded—namely, sexual coloration. Among marine animals we find a number of cases of specific variation in colour which can be explained in part along the lines of protective coloration; thus, *Planes minutus* among the Brachyura shows at least five variations of colour, all of which are in harmony with the tints of the Sargasso weed. I am unable to apply the principle of protective coloration to the case of *Echinus angulosus*. It is true that the red variety is sometimes found at depths at which in ordinary circumstances it may, from the diving experiments of Fol at Nice,

appear black; but this does not hold true for the other varieties of colour, the blue and green &c. The various colours of *Echinus angulosus* as seen in the rock-pools are very conspicuous and show no similarity to their surroundings. In a number of cases the tests of the species are sometimes hidden by empty shells, stones, &c., and these, as held by Simroth for *Tecopneustes lividus*, may be a source of protection against the force of the waves on an exposed beach, and also assist in collecting organic particles.

The application of the theory of "warning" coloration to the case of *Echinus angulosus* is also well-nigh untenable. There is so much variety of colour in a group of this species that one could not say that any definite colour was a "warning" colour. It is true that the species is a more or less gregarious one, and that a preying fish might easily locate the colony; but the greys to some extent neutralize the blues, &c., and the effect of a colony all members of which were one definite colour would, from this point of view, be more efficacious as a "warning" mark. I have already pointed out that the gonads of this species are used as food by man, and I noted that the species occasionally fall as prey to fishes with sufficiently powerful jaws, such as the white stumpnose, the panga, and the daggerad. Agassiz has also pointed out that the two more common species of sea-urchins of New England are greatly eaten by the cod and the haddock. Mcintosh has shown that the green-pea urchin is frequently eaten by the haddock. It is of interest that the brightly coloured *Strongylocentrotus lividus* (in its colour somewhat similar to the purple or blue forms of *E. angulosus*) is eaten by cod and haddock, as pointed out by Nordgaard. Semon has also shown that Echinoderma sometimes serve as food for mollusca, which dissolve the calcium salts by the secretion of sulphuric acid. Saville Kent has directed attention to the fact that Echini are food for *Cestracion*. Fourtau has shown that they may be eaten by crabs; Herdman, Johnstone, and Scott have alluded to Echinoids in the stomachs of flat-fish. Apart from these facts, the Echinoids must have their great mortality period during their larval stages; for example, it has been pointed out by Gardiner that the ova and larvæ of Echinoderms are food for corals, such as *Euphyllia*. The adult forms are well protected from enemies by their long spines, their poisonous pedicellariæ, and their disagreeable smell.

It is also impossible to hold that the colours of *E. angulosus* are cases of "aggressive" resemblance. The food of Echinoids, as pointed out by Allen, mainly consists of fine



sand and silt, red and brown seaweeds, annelids, lamelli-branchs (such as oysters, barnacles, polyzoa, ostracods, small algæ, and hydroids), and it is impossible to believe that in any of those cases aggressive resemblance would be of any advantage.

It occurred to me that it was possible that the blue and grey specimens might be located in the higher reaches of the shore and the red on the lower parts, but I found nothing to support this supposition. One may, however, safely say that on the shore the purple and grey specimens predominate in number over the red; thus out of 341 specimens of *Echinus angulosus*, observed between high- and low-water marks, 168 specimens were purple, 131 were grey, and 41 red. According to Nutting and others blue is a colour which is very rarely present in deep-sea animals.

I have nothing in support of the surmise that the variable colour of this species may be partly due to the changing conditions of environment which are usually associated with the sea-shore, for specimens from 20–30 fathoms also show a similar variation in colour. At that depth, as on the sea-shore, the purples (so far as my observations went) predominated in number over the red varieties.

It is much more probable that the variable colour of *Echinus angulosus* is due to internal physiological processes of the individuals themselves, and it is possible may have some relation to the intensity of light, as held by Doflein for the Decapod Crustacea. According to Doflein feeble light is sufficient for the formation of red pigment, and under the influence of light and still unknown internal processes red may be transformed into yellow or blue pigment, the latter being temporary, visible only when produced in large quantities, but under other conditions is destroyed as soon as formed—in species living in intense sunlight the formation of blue pigment exceeds its destruction.

The colours of *E. angulosus* probably have no adaptive significance—in other words, so far as its colour-characters are concerned, these have been evolved apart from the influence of natural selection.

In Echinoderma the probability is that the pigments of the test and spines are derivatives of “enterochlorophyll,” the pigment which occurs in the perivisceral fluid and which by some is held to be a respiratory pigment on account of the changes in colour which it undergoes on exposure to the air, and which we have seen in some cases resembles the colour of the spines. Durham has shown that in Echinoderma pigment occurs in wandering cells which may leave



the body at any point and give rise to temporary pigmentation. He regards the colouring-matters as either waste-products or effete respiratory pigments which, when cast out from the wandering cells or leucocytes, produce a coloration of the skin. List holds that "protein crystalloids in the nuclei of the wandering cells of Echinoids probably become pigment granules."

It may be interesting to compare *Echinus angulosus* with an equally bright-coloured form of northern seas, namely *Strongylocentrotus lividus*, the long spines of which vary "in colour from olive to violet purplish or even yellowish tint, tipped with yellow and all intermediate shades." Camerano showed that there are no constant differences in colour which would differentiate sex, and Bordas has pointed out that the ovaries of this species are palatable. Now, according to M'Intosh, the colours of *Strongylocentrotus* are not protective, and, indeed, it would be difficult for one to regard the colours as either "protective" or "warning," as this form, according to Agassiz and Caillard, sometimes conceals itself by digging out cavities in the solid rock, even in such as granite. MacMunn has shown by means of the spectroscope the presence of a respiratory pigment ("echinochrome") in *Strongylocentrotus lividus*, and this is probably also found in the leucocytes, but it has not yet been clearly shown what exact relation this pigment bears to the integumentary coloration.

In the opinion of the writer it is not necessary, even to a firm believer in the principle of "Natural Selection," that one should find in every case an adaptive explanation of the colour of a species. It is not essential to hold that every characteristic, colour or otherwise, which an animal possesses is adaptive.

The coloration of *Echinus angulosus* is not sexually dimorphic, and it cannot be grouped under the headings "protective" resemblance, "aggressive" coloration, "warning" indication, except by excessive exercise of imagination and ingenuity. The meaning of the coloration of *E. angulosus* is to be sought for in the internal physiological processes (probably respiratory or excretory) of the animals themselves. The variable tegumentary colouring of *E. angulosus* is probably due to by-products or waste-products produced during the metabolic processes.

I append a list of the synonyms and distribution of *Echinus angulosus* quoted from Agassiz:—

*Cidaris miliaris angulosa*!, Klein, 1734, Nat. Disp. Ech. pl. iii. figs. A, B.

- Cidaris angulosa*, Leske, 1778, Kl. Add. pl. iii. figs. A, B (copied in Enc. Méth. pl. cxxxi. figs. 5, 6).  
*Cidaris gualteri*, 1742, Index Test. pl. cviii. fig. A (copied in Enc. Méth. pl. cxcviii.).  
*Cidaris*, Seba, 1758, Thes. iii. pl. x. fig. 20.  
*Cidaris*, Knorr, 1771, Dêlic. pl. D, figs. 4, 5.  
*Cidaris*, Audouin, in Savigny, Égypte, pl. vii. fig. 2.  
*Echinus subangulosus*!, Lamk. 1816, An. s. Vert. p. 48 (non Blainv.).  
*Echinus subangulosus*, Desml. 1837, Syn. p. 270. Cape of Good Hope.  
*Psammechinus subangulosus*!, Agass. 1846, C. R. Ann. Sc. Nat. vi. p. 368.  
*Psammechinus*, Duj. Hupé, 1862, Échin. p. 527.  
*Psammechinus verruculatus*, Lütke. 1864, Bid. p. 166.  
*Echinus minimus*!, Blainville, 1825, Dict. Sc. Nat. O. p. 80. Cape of Good Hope.  
*Echinus minimus*, Desml. 1837, Syn. p. 274.  
*Echinus minutus*!, Blainv. 1834, Actin. p. 227.

Mortensen has, however, proposed to establish a new genus, which he terms *Parechinus*, for *Echinus miliaris*, *E. microtuberculatus*, and *E. angulosus*, chiefly on account of the globiferous pedicellariæ.

*Localities.* Cape of Good Hope (*Wahlenberg*); Simon's Bay (*W. Stimpson*); Cape Town (*Layard*); Nikobar (Mus. Vienna); Butu (Bonn Museum); Mauritius (Stockholm); Mozambique (*Bianconi*); New Zealand (*Edwards*); Adelaide, east coast Australia (Brit. Mus.); Red Sea (*Hemp. u. Ehreb.*, Mus. Berl.); Suez (*J. d. P.*); Philippine Islands (*Semper*).

This species is thus distributed in widely separated localities, and I also had the opportunity of verifying its occurrence at numerous places on the South-African coast, being there the commonest species of Echinoid.

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XXII.—*New and little-known Diptera Nematocera from Ceylon.* By F. W. EDWARDS.

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A SMALL collection of Diptera Nematocera recently made by Mr. J. C. F. Fryer in Ceylon contains a number of interesting forms which it seems desirable to place on record: several appear to be new to science, while others, previously known from other regions, have not till now been recorded from Ceylon. The types of the new species have been generously presented to the National Collection by Mr. Fryer. In addition to the species referred to in more detail below, the collection contains the following:—*Sciara rufithorax*, Wulp; *Leiomysia arcuata* (Brun.); *Allactoneura cincta*, Meij.; *Plecia fulvicollis*, F.; *Phlebotomus maculatus*, Ann.; *Psychoda albopicta*, Brun.; *Ochlerotatus pallidostriatus* (Theo.); *Wyeomyia greenii*, Theo.; *Pselliophora taprobanes* (Walk.); *Tipula ochripes*, Brun.; *Pachyrhina pleurinotata*, Brun.; *Pachyrhina?* *javensis*, Dol.; *Libnotes pæcilopecta*, O.-S.; *Teucholabis fenestrata*, O.-S.; *Teucholabis* (*Gymnastes*) *cyanea*, Edw.; *Conosia irrorata*, Wied.; *Eriocera crystallopecta*, O.-S.; *E. tuberculifera*, Edw.; *E. ctenophoroides*, Edw.; *E. albonotata*, Lw.

**Mycetophilidæ.**1. *Macrocera fryeri*, sp. n.

Length of body 3-4 mm., of antenna 12-16 mm.

♂. Brownish yellow; wings not hairy, with dark markings.

*Head* yellowish, more brownish on the vertex; antennæ with the first three joints yellowish, the remainder dark brown; palpi brownish. *Thorax* yellowish brown; a dark brown vertical stripe on the pleuræ, extending on to the sides of the mesonotum, situated between the first two pairs of legs. *Abdomen* brownish yellow, the middle segments indistinctly darker at the base. *Legs* yellowish brown, the tarsi somewhat darker. *Wings* bare; apical third occupied by a large dark brown patch, the anterior edge of which is rather irregular and has a large angular projection on  $Cu_1$ ; another brown patch towards the costa near the middle of the wing, filling the greater portion of the cell  $R_1$ ; a small one near costa, more towards the base, including origin of  $Rs$ , and a brown spot in the cell  $Cu_1$  a little way from the base;  $Sc$  reaching costa opposite origin of  $Rs$ . Halteres yellowish, knobs dark.

Peradeniya, ix. 1911; 4 ♂.

The strongly darkened apical third of the wing plainly marks this species off from the seven described by Brunetti from the Orient.



*Macrocera fryeri*, sp. n. Wing,  $\times 13$ .

2. *Leiomyia maculicoxa* (Enderlein).

*Leia maculicoxa*, End. Trans. Linn. Soc., Zool. xiv. p. 69 (1910).

*Rhymosia fascipes*, Brun. Fauna Brit. Ind. p. 106 (1912).

Peradeniya, x. 1912; 1 ♂.

There is no doubt as to the above synonymy, since the genitalia of the Ceylon and Seychelles specimens appear



identical and the coloration is practically the same, the only difference being that the Seychelles specimens have a more or less distinct dark fascia near the apex of the wing, which in the Ceylon specimens is so faint as to be practically absent. The lateral ocelli are absolutely contiguous with the eye-margins and the subcosta is very faint in its apical portion, not distinctly reaching the costa. These two peculiarities no doubt led Brunetti to place the species in *Rhymosia*, but the general appearance and (apart from the evanescent subcosta) the venation are those of a typical *Leiomyia*. Precisely the same peculiarities are exhibited by *Leia seychellensis*, End., and by some undescribed African species which I have examined. Brunetti's *Rhymosia annulicornis* and *R. humeralis* are doubtless also species of *Leiomyia*. *Leiomyia*, Rond. (emended form of *Lejomya*, Rond.), is the name which should be used for *Glaphyroptera*, Winn. *Leia*, Mg., is wrongly applied to it. Since Winnertz was the first person to divide Meigen's *Leia*, by the rules of the Zoological Congress his interpretation must be followed. Curtis designated a type of *Leia* which Winnertz did not accept, and Rondani renamed the genus, thinking the original name was preoccupied; but these facts are altogether irrelevant.

#### Chironomidæ.

3. *Ceratopogon* (s. str.) *jacobsoni*, Meij. Tijds. v. Ent. 1. p. 212 (1907).

Peradeniya, i. 1912. "Attracted by alcohol." 7 ♀.

In all but one of these specimens the postnotum is blackish; in the remaining one, as (presumably) in the Javanese specimens, it is yellowish. The posterior branch of the cubitus ( $Cu_2$ ) is oblique outwardly, not inwardly as in de Meijere's figure. Nevertheless, I have little doubt that *C. jacobsoni* is the species before me.

4. *Ceratopogon* (s. str.) *hirtipes*, Meij. Tijds. v. Ent. 1. p. 209 (1907).

Peradeniya, 17. xi. 1911, 4 ♀; i. 1912, 1 ♀. "17. xi. 1911. Two larvæ of *Papilio clytia* found in gardens; each was being attacked (sucked) by a small fly, apparently a *Ceratopogon*?—J. C. F. Fryer."

The dark ring on the hind femora reaches almost to the tip, leaving only the extreme knee-tip bare. In this species, as in the preceding, the eyes of the female are contiguous. Both species have till now been recorded only from Java.

5. *Macropeza javanensis*, Kieff. Mem. Ind. Mus. ii. p. 210 (1910).

*Macropeza gibbosa*, Meij. (nec Wied.) Tijd. v. Ent. l. (1907).

Peradeniya, ii. 1912; 1 ♀.

This species is very much like the following; it differs in the dull brownish-black (not shining black) thorax, which is only very slightly produced forwards and does not end in a sharp point; also in the yellow (instead of black) femora and tibiae. By the last-named character it also differs from *M. albitarsis*, Mg.

6. *Macropeza gibbosa*, Wied. Analecta Ent. p. 10 (1824).

*Calyptopogon albitarsis*, Kieff. Mem. Ind. Mus. ii. p. 209 (1910).

Peradeniya, x. 1911–ii. 1912; 4 ♀.

Wiedemann's brief description of *M. gibbosa* notes all the more salient features of Kieffer's *C. albitarsis*, and the two names may be safely considered to apply to the same species. The genera *Macropeza* and *Calyptopogon* are so similar that the propriety of their separation seems open to question.

### Tipulidæ.

7. *Tipula gracillima*, Brun. Fauna Brit. Ind. p. 302 (1912).

Peradeniya, vi. 1912; 1 ♀.

Brunetti has apparently overlooked the fact that the white rings on the femora are present on the two anterior pairs only.

8. *Pselliophora? elongata*, sp. n.

♀. Length of body 34 mm., of wing 23 mm.

Brown; wings clouded; abdomen with whitish lateral spots.

*Head* dark reddish brown, palpi and antennæ blackish brown towards the apex. Antennæ 13-jointed, a little shorter than the thorax, sparsely hairy; second joint extremely short, flagellar joints about equal in length, the first six each with two prominent rounded lobes on the underside, becoming less marked in the apical joints. *Thorax* dark brown; mesonotum in front of the suture with four lighter reddish-brown stripes, the two middle ones closely approximated and reaching the front margin, the lateral ones only about half as long; behind the suture on each side are two reddish-brown spots; scutellum almost round, reddish brown; postnotum reddish brown in the middle, dark brown at the sides;

pleuræ with some small pale patches. *Abdomen* long and tapering, dark brown, the first four or five segments with ill-defined reddish-brown patches above, while the first seven segments have almost triangular creamy-white lateral spots, situated at the base of each segment, except those on the second segment, which are placed near the middle. Ovipositor dark brown. *Legs* short and stout, dark brownish, the whole tarsi not much longer than the tibiae. *Wings* very broad (7.5 mm.), strongly infuscated, the veins narrowly bordered with blackish; costal cell yellowish brown; light patches as follows: (1) in the upper basal cell (R) just before origin of Rs; (2) a larger patch in marginal and upper basal cells ( $R_1$  and R) a little beyond origin of Rs; (3) a large patch just beyond the stigma, extending from costa across cells  $R_2$ ,  $R_3$ , and  $R_{4+5}$ ; (4) a large but ill-defined patch towards the apices of cells M and Cu; (5) a patch near base of cells Cu and An. *Halteres* yellowish.

Hakgala, 4500 feet, v. 1911; 1 ♀.

The generic position of this remarkable insect is somewhat doubtful. In its more sober colouring and in its long tapering abdomen it differs conspicuously from the known species of *Pselliophora*, but, as from the structure of the thorax and legs it evidently belongs to the *Ctenophora* group, and as the restricted genus *Ctenophora* is not definitely known to occur in the Orient, I have placed it provisionally in *Pselliophora*.

9. *Libnotes thwaitesiana*, Westw. Trans. Ent. Soc. p. 505 (1876).

*Libnotes rufa*, Meij. Tijd. v. Ent. liv. p. 39 (1911).

Peradeniya, x. and xi. 1911; 2 ♀.

Westwood described the head as being black, but this doubtless referred to the eyes, which are in striking contrast with the red-brown body. *L. rufa* was described from a small specimen; all the species of this genus seem to vary greatly in size. Westwood's type was from Ceylon.

10. *Styringomyia ceylonica*, Brun. (nec Edw.) Fauna Brit. Ind. p. 461 (1912).

Peradeniya, xii. 1911; 1 ♂, 1 ♀.

The male hypopygium figured by Brunetti is quite different from that of *S. ceylonica*, Edw., and resembles that of *S. didyma*, Grimshaw (Brunetti's figure represents a ventral, not a dorsal view). I hope to issue a revision of the genus

*Styringomyia* shortly, and so defer consideration of Brunetti's species until then.

11. *Trentepohlia speiseri*, sp. n.

*Mongoma exornata*, Speiser (nec Bergr.), Berl. ent. Zeit. lii. p. 135 (1907).

Length of body 5 mm.

♂ ♀. *Head*, including antennæ and palpi, dark brownish. *Thorax* dark reddish brown. *Abdomen* blackish brown. *Legs* light yellowish, the tips of the tarsi a little darker. Front and middle femora with about eight short bristles near the base beneath. *Wings* with a brown apex, much darker towards the costa, but leaving a small clear space in the cell  $R_2$  (first submarginal); a large brown patch in the middle of the wing, extending one-third of the way across and in breadth reaching from the base of  $R_s$  to the apex of  $Sc$ ; cross-veins and veins  $R_{4+5}$  and  $Cu$  dark-margined.  $Cu_1$  joining  $M$  slightly (♀) or considerably (♂) before its fork;  $Cu_2$  joining  $An$  near its tip. *Halteres* yellowish.

Peradeniya, ii. 1912; 1 ♂ (type; wing figured). I have also seen the species from the following African localities:—Entebbe, Uganda (*Capt. E. D. W. Greig, I.M.S.*), 1 ♂; Stanleyville, Belgian Congo, i. ix. 1904, 1 ♀; Bo, Sierra Leone (*Dr. H. E. Arbuckle, W.A.M.S.*), 1 ♀; Gold Coast (*Willoughby P. Lowe*), 2 ♀. The African specimens are rather larger and have the tips of the femora slightly darkened.

This species closely resembles *T. exornata*, Bergr., but the presence of a well-marked brown patch in the middle of the costa seems to indicate that it is really distinct.



*Trentepohlia speiseri*, sp. n. Wing,  $\times 13$ .

12. *Epiphragma kemp*i, Brun. Rec. Ind. Mus. viii. p. 155 (1913).

Hakgala, 4500 feet, v. 1911; 1 ♂.

The wing-markings of this specimen do not quite agree with Brunetti's figure, but it is certainly only a variation of his species, and may be conspecific with *E. signata*, Meij.



## XXIII.—On new Mammals obtained by the Utakwa Expedition to Dutch New Guinea. By OLDFIELD THOMAS.

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THE British Museum owes to the organisers of Dr. A. F. R. Wollaston's recent expedition, *viâ* the Utakwa River, to the snow mountains of the Charles Louis Range, Dutch New Guinea, the considerable series of mammals obtained during the expedition. Mr. C. B. Kloss, already so well known as a mammal collector in the Malay Peninsula and islands, was in charge of the collecting work and it was hoped that a really large series of different forms would have been obtained. But the difficulties in the way of collecting, especially the entire unsuitability of the natives to give any help, prevented any number of the interesting arboreal forms being obtained, amongst which novelties are most to be looked for. On the other hand, thanks to the industry of Mr. Kloss and his Dyak trappers, a very good series of terrestrial species was obtained, notably a particularly good set of the genus *Uromys*, which is represented by no less than six species, three of them being new. In all, the collection consists of about 150 specimens, which form a very valuable and acceptable addition to the British Museum's material from that still little-known island New Guinea.

*Hipposideros wollastoni*, sp. n.

Near *H. muscinus*, but with a doubled posterior nose-leaf and more inflated muzzle to the skull.

General external characters approximately as in *muscinus*, with the one important exception that the posterior nose-leaf has behind it a peculiar duplication developed to an extent unlike anything hitherto known in the genus. This duplication consists of a transverse crest growing out at the back of and parallel with the main crest, the groove between the main and supplementary crests being subdivided into three cells by two longitudinal connecting-bands. In *H. muscinus* there are merely some inconspicuous warts or convexities in the position of the complicated and definite structure now described. Its nearest analogue is found in the African *H. caffer*, where there is a less developed supplementary crest, but no trace of the longitudinal connecting-bands. Ears of the comparatively broad shape distinguishing *H. muscinus* from the allied Australian species *H. semoni* and *stenotis*.

Skull markedly smaller than that of *H. muscinus* in all dimensions, except that, owing to the proportionally smaller size of the brain-case, the area occupied by the inflated frontals is of equal extent. Frontal inflation much more developed, high, convex, rounded, so as to form behind it a deep concavity in the frontal profile. Supraorbital ridges behind the inflation much less sharply developed. Teeth smaller throughout. Small upper premolar well developed.

Dimensions of the type (measured on the spirit-specimen) :—

Forearm 44 mm.

Head and body 45; tail 27; ear  $15 \times 13$ ; third finger, metacarpus 31, first phalanx 13.5; lower leg and hind foot 21.7.

Skull: length to front of canines 17.3; zygomatic breadth 9.5; mastoid breadth 8.1; front of canine to back of  $m^3$  6.7.

*Hab.* Utakwa River, S.W. New Guinea.

*Type.* Adult female. B.M. no. 13.6.18.4. Collected January 1912.

This species, so like *H. muscinus* in other respects, is at once distinguished by the remarkable duplication of the posterior nose-leaf.

The following new *Hipposideros* may also be conveniently described here :—

*Hipposideros stenotis*, sp. n.

Allied to *H. semoni*, Matsch., but smaller, and with conspicuously smaller skull and teeth.

External characters very much as in *H. semoni*, the mesial wart on the sella similarly elongate and the ears equally, or perhaps even more, remarkably narrowed and pointed. Posterior nose-leaf with its convexity behind not developed into a supplementary leaf. Tail with its two terminal vertebrae absent or aborted in the type, but this may be accidental or pathological.

Skull much smaller in all dimensions than in *semoni*, the frontal prominences less developed. Teeth even more reduced in proportion than the skull, the molars only about half the bulk of those of *semoni*. Small upper premolar absent in the type, as it is in the type of *semoni*, but this is evidently an inconstant character, as the tooth is present in the two Museum specimens of *semoni*.

Dimensions of the type (measured on the spirit-specimen) :—

Forearm 43.5 mm.

Head and body 45; ear  $18 \times 10$ ; third finger, metacarpal 32, first phalanx 16; lower leg and foot 28.5.

Skull: length to front of canines 17; zygomatic breadth 9.1; mastoid breadth 7.8; front of canine to back of  $m^3$  5.8.

*Hab.* Northern Territory of S. Australia. Type from Mary River.

*Type.* Adult female. B.M. no. 97.4.12.7. Collected by Dr. Knut Dahl. Received in exchange from the Christiania Museum.

*Stenomys klossii*, sp. n.

A mountain-rat allied to *S. niobe*.

Externally quite similar to *S. niobe*, the colour and length of fur quite as in that species. Feet in some specimens with whitish digits, in others wholly brown.

Skull longer than in *niobe*, with more inflated brain-case and longer narrower muzzle. Interorbital region broader than in *niobe*, its edges with rudimentary ridges, not quite smooth. Anteorbital plate very narrow, decidedly narrower than in the smaller skull of *niobe*, its front edge strongly slanted. Palatal foramina rather longer, their hinder end not so distant from the molars.

Dimensions of the type (measured in flesh):—

Head and body 123 mm.; tail 130; hind foot 27; ear 18.

Skull: greatest length 34.3; condylo-incisive length 31; zygomatic breadth 15.8; nasals 12.6; interorbital breadth 6; breadth of brain-case 14.6; palatilar length 15; palatal foramina 5.2; upper molar series 5.6.

*Hab.* Upper Utkwa River, southern slope of Charles Louis Mountains, Dutch New Guinea. Type from "Camp 9," alt. 5500'. Other specimens from "Camp 11," 8000'. Seven specimens.

*Type.* Adult male. B.M. no. 13.6.18.83. Original number 91. Collected 1st February, 1913, by C. B. Kloss.

I have named this interesting mountain-rat in honour of Mr. C. B. Kloss, who had charge of the mammal-collecting during the Utkwa Expedition. The species was the only mammal obtained at the higher collecting-stations.

UROMYS.

Of the large rats of the *Uromys macropus* group the Utkwa Expedition obtained examples of two species, from low country and 2500' respectively.

These appear to be both unnamed, and may be described as follows :—

*Uromys nero*, sp. n.

Size very large, though less than in the giant *U. anak* and *rothschildi*. Fur harsh and thick, the under surface more completely hairy than in the next species. General colour above very dark, coarsely grizzled bistre, the median dorsal area blackish, markedly darker than the sides. Sides of cheeks and shoulders grey. Under surface pure white, sharply defined laterally; inner sides of limbs prominently white. Hands and feet pale brown above. Tail practically quite naked, a few isolated hairs, less than a scale in length, perceptible with the help of a lens; its terminal third to one-half prominently yellow all round, while the base also is more or less yellow below, the usual black being thus restricted to the upper side of the basal portion.

Skull very large and powerfully built, larger and heavier in proportion to the size of the animal and the length of the feet than in any other species; its shape normal, the forehead not specially convex. Interorbital region smooth, faintly concave, its edges sharp, but without distinct beading. Posterior narial opening much broader than in the next species.

Dimensions of the type (measured in the flesh):—

Head and body 279 mm.; tail 232; hind foot 56; ear 30.

Skull: greatest length 68.3; condylo-incisive length 63.7; zygomatic breadth 36.5; nasals  $25 \times 8.5$ ; interorbital breadth 11; breadth of brain-case 25.5; palatilar length 36; palatal foramina 8.2; width of mesopterygoid fossa 6.5; upper molar series (crowns) 12.2.

*Hab.* Utakwa River, at middle altitudes, type from "Camp 3." 2500'.

*Type.* Old female with worn teeth. B.M. no. 13. 6. 18. 13. Original number 67. Collected 15th December, 1912, by C. B. Kloss. Two adult and three young specimens examined.

This fine species differs from all hitherto-described forms allied to it by its dark coloration, the result of the saturate conditions in which it lives. While smaller in all respects than the giant black-tailed species *U. anak* and *rothschildi*, it is larger, so far as regards skull, than any of the other yellow-tailed forms.

From its lowland neighbour *U. scaphax* it differs by its



larger size, more yellow tail, whiter underside, and normal-shaped skull with unbowed forehead and broad posterior nares.

*Uromys scaphax*, sp. n.

Related to *U. aruensis*, Gray, but coloration not rufous.

Size large, though less than in *U. nero*. Fur harsh, under surface thinly haired. General colour above dark grizzled greyish, with a slight fulvous tinge; dorsal area slightly darker than rest, but not distinctly blackish as in *U. nero*. Under surface and inner sides of limbs white, but owing to the sparseness of the fur the skin shows through to a great extent, the practically naked condition of the inner sides of the limbs being especially noticeable. Hands and feet pale brown. Tail more completely black than in most species of this section, the yellow confined to the tip and in one case reduced there to a mere spot half an inch long.

Skull strikingly like that of *U. aruensis*, of similar size and with the same high, bowed, and convex forehead and broad interorbital space. Opening of posterior nares markedly narrower than in *U. nero*.

Dimensions of the type (measured in the flesh):—

Head and body 277 mm.; tail 235; hind foot 52; ear 26.

Skull: greatest length 62.5; condylo-incisive length 57.4; zygomatic breadth 32.2; nasals  $21.5 \times 6.4$ ; interorbital breadth 11.8; breadth of brain-case 22; palatilar length 31.2; palatal foramina 6.6; width of mesopterygoid fossa 5; upper molar series (crowns) 10.5.

*Hab.* Utakwa area at low levels. Type from Canoe Camp, Lower Setakwa River, alt. 150'. Other specimens from Launch Camp, 20'. Also received from the Mimika River; collected by G. C. Shortridge.

*Type.* Adult female. B.M. no. 13.6.18.8. Original number 206. Collected 25th October, 1912, by C. B. Kloss. Four specimens.

This species is evidently nearly allied to the Aru I-land species, *U. aruensis*, the skulls of the two forms being practically identical; but it has the more normal colouring of the Papuan species (being intermediate in this respect between *U. nero* and *U. validus*), instead of the rich rufous of the island-rat.

With regard to Dr. Jentink's "*Pogonomys multiplicatus*," from the Sentani Lake, on the northern side of New Guinea,

which may possibly be one or other of the species now described, I regret that no exact determination of it seems to be possible. It was based on a young specimen with the third molar barely erupted, so that, even with topotypes, it will probably always be difficult to be certain of its identification, since several species may occur in near neighbourhood to one another. All the species of this group have the multiplicate character of the palate, which seems to have been the chief reason for Dr. Jentink's venturing to describe so young a specimen.

Of the smaller forms of *Uromys* the Expedition obtained 55 specimens, apparently referable to four different species, as follows :—

1. Size rather small. Tail wholly black. Belly-hairs white to their bases ..... *U. stalkerii calidior*, Thos.

At Launch and Canoe Camps, Setakwa River. Sea-level to 150 ft.

2. Size larger. Tail conspicuously bicolor. Belly-hairs mouse-grey at base ..... *U. lorentzi*, Jent.

At same camps as No. 1.

Closely related to *U. levipes*, Thos.

3. Size smaller. Tail partially and indistinctly bicolor, with dull yellowish markings on its under side. Belly hairs slaty basally.

*U. platyops*, Thos.

At Camp No. 3 above the Utakwa River. Alt. 2500'.

4. Size fairly large. Tail as in No. 3. Fur long, soft, and woolly. Under surface dull buffy, with long slaty-grey bases.

*U. mollis*, sp. n.

At Camps Nos. 6 c and 9, Upper Utakwa River. Both at altitude 5500 ft.

In addition, there should apparently occur a species like No. 1, but larger, which was described from the Noord River as *Pogonomys leucogaster* by Jentink. This is evidently closely allied to Peters's *U. bruijnii* from Salawatti.

### *Uromys mollis*, sp. n.

Size rather less than in *U. lorentzi*. General characters very much as in No. 3 above, but the fur longer, softer, and woollier, the colour all over duller and more "saturate," that of the belly less sharply defined laterally, more suffused with buffy, and with the slaty bases much longer. Feet dull buffy.

Skull with a more rounded convex brain-case than in other species. Interorbital region broad, little ridged.

Dimensions of the type (measured in flesh) :—

Head and body 161 mm.; tail 140; hind foot 34; ear 21.

Skull : greatest length 39·5 ; condylo-incisive length 36·2 ; zygomatic breadth 18·5 ; nasals 13·8 ; interorbital breadth 7·1 ; breadth of brain-case 15·7 ; palatilar length 18·5 ; palatal foramina 5·9 ; upper molar series 8.

*Hab.* Southern slope of Mt. Carstenz, Charles Louis Mts., Dutch New Guinea, on Upper Utakwa River. *Type* from "Camp Padang, 6 c." Altitude 5500'. Four specimens.

*Type.* Adult male. B.M. no. 13. 6. 18. 35. Original number 231. Collected 17th February, 1913, by C. B. Kloss.

This is a soft-furred highland form, apparently most related to No. 3 of the lower country, though the different shape of the skull shows that it is not a mere local representative of that species.

*Phascogale murex aspera*, subsp. n.

Nearly allied to the true *Ph. murex*, Thos., but with shorter skull and heavier teeth.

External appearance almost exactly as in *murex*, except that the limbs are of the same brown colour as the body, instead of being a little greyer, and the light ends to the hairs of the underside are more or less buffy instead of being white ; the light colour of the underside is also more diffused and less sharply defined from the brown colour of the flanks. Fur of exactly the same crisp character as in *Ph. murex*.

Skull comparatively low, with shorter broader muzzle and broader interorbital region than in the typical form. As indicating the shortness of the muzzle it may be noted that the space occupied by the premolariform teeth (6·2 mm.) is shorter than in *murex* (7·6 mm.), while that occupied by the molariform teeth (10·3 mm. as against 9·0 mm.) is longer. Molariform teeth much larger and heavier throughout. Premolars evenly increasing in size backwards.

Dimensions of the type (measured in flesh) :—

Head and body 169 mm. ; tail 180 ; hind foot 33 ; ear 21.

Skull : condylo-basal length 43 ; zygomatic breadth 22·7 ; nasals  $16 \times 5\cdot3$  ; intertemporal breadth 8·7 ; mastoid breadth 16·6 ; palatal length 24·4 ; breadth between outer corners of  $m^3$  14·2 ; combined length of three anterior molariform teeth 8·9.

*Hab.* Utakwa River ("Camp No. 3"). Alt. 2500'.

*Type.* Adult female. B.M. no. 13. 6. 18. 90. Original number 40. Collected 1st December, 1912, by C. B. Kloss.

This *Phascogale* is practically identical externally with the

true *Ph. murex* of German New Guinea, but is distinguished by its shorter muzzle and larger teeth.

The Expedition also obtained a second example of *Phascogale melanura modesta*, Thos., previously only known from the type.

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#### XXIV.—*Some new Species of Uromys.*

By OLDFIELD THOMAS.

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BESIDES the two species of *Uromys* above described from the Utaqua River, Dutch New Guinea, there appears to be evidence of at least four species belonging to the group of the large Papuan *Uromys* which have the terminal half of the tail yellow.

The first of these is *U. barbatus* (*Mus barbatus*, M.-Edw.), from the Aroa basin, S.E. New Guinea, of which the typical skull has been kindly lent me by Prof. Trouessart. In this the skull is narrow, with but little-expanded zygomata, low in the facial portion, with a strongly marked parietal convexity, from which the profile runs forwards in a straight line to the tip of the nasals. The palatal foramina are unusually wide apart and divergent behind, instead of being narrow and parallel. The pterygoid plates seem to be little developed and to begin further backwards, but the skull is in a somewhat unsatisfactory condition, and it is impossible to be sure of its natural characters. The hind foot of the type is 59 mm. in length.

Secondly, there is *U. validus*, Peters and Doria, to which I refer two specimens from Owgarra, Angabunga R. (*Meek*), and one from Madeu (*Stalker*), British New Guinea. The type was from Katau (*d'Albertis*).

In this species the skull is of normal shape, the upper profile evenly and slightly convex throughout, with but little parietal convexity or frontal flattening. The supraorbital edges are sharply square, with a slight concavity between them. Zygomata well expanded. Palatal foramina narrow, parallel. Mesopterygoid fossa rather narrow. Hind foot 52–56 mm.

A third described species is Ramsay's "*Hapalotis papuanus*," but the type having disappeared, several of the skull- and tooth-measurements being inconsistent with each other,



as though misprinted, and there being no certain locality, I think it best to treat the species as indeterminable.

In addition the Museum contains examples of the two following new forms:—

*Uromys ductor*, sp. n.

Like *U. validus*, but with larger skull. Colour more fulvous.

General colour above approaching "cinnamon," quite uniform in the two available skins. Hands whitish. Feet pale brown.

Skull in all essential characters as in *U. validus*, but size larger. Supraorbital ridges rather more strongly developed. Mesopterygoid fossa broader.

Dimensions of the type (measured on skin):—

Head and body 325 mm.; tail 280; hind foot 55; ear 26.

Skull: greatest length 65; condylo-incisive length 61.5; zygomatic breadth 32; nasals  $24.2 \times 7.4$ ; interorbital breadth 9.4; breadth of brain-case 21.5; palatilar length 32.6; palatal foramina 7.3; breadth of mesopterygoid fossa 5.2; upper molar series 11.2.

*Hab.* Avera, Aroa River, British New Guinea. Another specimen from Dinawa, Owen Stanley Range (A. E. Pratt).

*Type.* Adult male. B.M. no. 3. 12. 1. 4. Collected by A. S. Meek. Three adult specimens examined.

This species is no doubt closely allied to what I consider as *U. validus*, but is distinguished by its larger skull and more fulvous colour.

*Uromys prolixus*, sp. n.

Like *U. validus* and *ductor*, but with long feet and long narrow skull.

Size greater than in *U. ductor*, the hind foot 64 mm. in length. General colour about as in *U. validus*, apparently not so fulvous as in *ductor*, but as the specimen is in spirit not much dependence can be placed on the exact shade of colour. Hands white; feet white, with a wash of greyish brown on the metatarsals. Tail with terminal half yellow.

Skull long and slender, much longer than in *ductor*, but the zygomata not more widely expanded. Upper profile slightly convex in the parietal region, then concave between the orbits, strongly convex above the base of the zygomata, the nasals sloping downwards from the frontal convexity. The frontal region is also convex in the other direction, high mesially, sloping laterally. Supraorbital edges with

well-marked ridges and slight postorbital projections. Palatal foramina narrow, parallel. Mesopterygoid fossa fairly wide.

Dimensions of the type (measured on the spirit-specimen):—

Head and body 265 mm.; tail 272; hind foot 61; ear 25.

Skull: greatest length 66·6; condylo-incisive length 62; zygomatic breadth 32·2; nasals  $24\cdot2 \times 8\cdot2$ ; interorbital breadth 10; mastoid breadth 21; palatilar length 33·5; palatal foramina  $7\cdot3 \times 3\cdot3$ ; width of mesopterygoid fossa 5; upper molar series 12·2.

*Hab.* Haveri,  $9^{\circ} 25' S.$ ,  $147^{\circ} 35' E.$  British New Guinea. Alt. 700 m.

*Type.* Adult male in spirit. B.M. no. 97. 8. 7. 67. Collected by Dr. L. Loria, and presented by the Museo Civico, Genoa.

This species is distinguished by its long foot and long slender skull, with convex frontal region and long molar series.

Of the smaller forms of *Uromys* there seem to be a considerable number of species, all closely allied and distinguishable merely by size and slight differences in colour. The following appear to be undescribed:—

*Uromys arcium*, sp. n.

Size comparatively large, the skull larger than in any of the other small species. General colour above dull rufous brown (specimen skinned from spirit); below whiter throughout, not very sharply defined laterally, the hairs white to their roots. Hands and feet whitish, the metapodials browner. Tail unusually short, shorter than the head and body, practically naked, the few scattered hairs less than a scale in length; with about fourteen rings of scales to the centimetre\*; blackish above, inconspicuously lighter below.

Skull strongly built, heavier than in the few species of the *U. levipes-moncktoni* group which equal it in length. Interorbital edges with fairly well-marked beads, which are less divergent posteriorly than in *U. levipes* and its allies.

Dimensions of the type (measured on the spirit-specimen):—

Head and body 138 mm.; tail 127; hind foot 28; ear 18.

Skull: greatest length 40; condylo-incisive length 38·1; zygomatic breadth 21; nasals  $13\cdot6$ ; interorbital breadth 6·8; mastoid breadth 14·7; palatilar length 18·1; palatal foramina 6·2; upper molar series 7·1.

\* Caudal scale-rings are always counted about the middle of the tail; they become more numerous towards the tip.

*Hab.* Rossel I., d'Entrecasteaux Group.

*Type.* Adult female. B.M. no. 89. 6. 3. 2. Collected 18th October, 1888, and presented by Basil Thomson, Esq.

Distinguished by its size, white belly, and comparatively short tail.

*Uromys melicus*, sp. n.

A medium-sized species with brownish under surface.

Size, as gauged by skull, markedly less than in *U. cervinipes*. General colour above varying from broccoli-brown to cinnamon; under surface soiled greyish for its greater extent, the hairs slaty basally and more or less buffy terminally. But the chin, throat, and axillary region are nearly always white, and there is also a white patch across the groin, so that in a series of specimens laid side by side there is a transverse band of white anteriorly, then a broad belt of soiled buffy greyish, succeeded by a second white band posteriorly. Hands and feet dull whitish. Tail wholly dark, with about eleven rings to the centimetre, the fine sparse hairs about a scale in length and rather more numerous than usual.

Skull smaller in all dimensions than in *U. cervinipes*; the supraorbital edges sharp and slightly beaded, more divergent posteriorly than in *U. cervinipes*.

Dimensions of the type (measured in flesh):—

Head and body 122 mm.; tail 149; hind foot 29; ear 19.

Skull: greatest length 32·7; condylo-incisive length 30·5; zygomatic breadth 17·3; nasals 11·1; interorbital breadth 4·9; mastoid breadth 13·5; palatilar length 14·2; palatal foramina 5·3; upper molar series 5·8.

*Hab.* Melville Island, Northern Territory of Australia. Type from Biro, Apsley Straits. Sea-level.

*Type.* Adult female. B.M. no. 13. 6. 28. 32. Original number 23. Collected 22nd January, 1912, by Mr. J. P. Rogers. Thirteen specimens examined.

"Trapped in the mangroves." "Trapped round tent." "Very common."—*J. P. R.*

Distinguished by its soiled buffy-greyish belly and whitish pectoral and inguinal patches.

A very similar *Uromys* occurs in some of the islets off the Cape York coast, but our material is not sufficient to say if it is or is not specifically identical with the Melville Island species.

*U. cervinipes*, Gould, of S. Queensland, and the doubtfully

distinct *U. banfieldi*, de Vis, of Dunk Island, N. Queensland, have the skull markedly longer than in *U. melicus*.

*Uromys lutillus*, sp. n.

A small species with buffy-greyish under surface.

Size much smaller than in any of the described species. General colour above dark clay-colour or dull fulvous. Under surface similar but paler, the hairs slaty at base, buffy terminally; throat, axillary region, and centre of belly with some ill-defined whitish patches, a large white patch covering the inguinal region. Hands and feet whitish. Tail uniformly brown; hairs very few; scale-rings about fifteen to the centimetre.

Skull with square unbeaded supraorbital edges. Palatal foramina unusually long, reaching back to the level of the front of  $m^1$ .

Dimensions of the type (measured in skin):—

Head and body (c.) 112 mm.; tail 115; hind foot 24.

Skull: greatest length (c.) 29; condylo-incisive length (c.) 27; tip of nasals to lambda 25.7; zygomatic breadth 15.2; nasals 10.3; interorbital breadth 4.3; palatilar length 12.7; palatal foramina 5.1; upper molar series 5.3.

*Hab.* Owgarrar, Angabunga R., S.E. British New Guinea.

*Type.* Adult male. B.M. no. 5. 11. 28. 20. Original number 20. Collected 3rd November, 1904, by A. S. Meek. Two specimens.

This *Uromys* is distinguished from all previously described species by its small size, and from the two next following by its long palatal foramina, comparatively large teeth, and buffy-grey underside.

*Uromys murinus*, sp. n.

A small insular species with white belly.

Size quite small, about as in *U. lutillus*. General colour above strong fulvous, but both the specimens have been skinned out of alcohol and are probably discoloured. Under surface white, the white narrowed on the belly. Hands and feet white. Tail of normal proportions, brown above, slightly paler below, its hairs few and short; scale-rings fourteen to the centimetre.

Skull with the supraorbital edges sharply square, not ridged. Palatal foramina of medium length, not quite reaching to the level of the front angle of  $m^1$ . Molars as long as, but rather narrower than, in *U. lutillus*, decidedly larger than in the next species.



Dimensions of the type (measured on the spirit-specimen):—

Head and body 97 mm.; tail 109; hind foot 24; ear 16.

Skull: greatest length 30; condylo-incisive length 27; zygomatic breadth 15; nasals 10; interorbital breadth 4·7; palatilar length 12·7; palatal foramina 4·9; upper molar series 5·2.

*Hab.* Murray Islands, Torres Straits. Type from Mer.

*Type.* Adult female. B.M. no. 99. 9. 10. 3. Collected and presented by Prof. A. O. Haddon. Another specimen collected by the Rev. S. MacFarlane.

*Uromys muscalis*, sp. n.

A small species with white belly and very small teeth.

External characters as in *U. murinus*, though the colour is rather less strongly fulvous. The specimens of both have been skinned out of alcohol, but it is not possible to say if they have been equally affected by it. Under surface and inner side of limbs wholly white. Tail brown above, lighter below; scale-rings about fifteen to the centimetre.

Skull smaller and more delicately built than in *murinus*; supraorbital edges sharply defined in the type, which is aged. Palatal foramina quite short, ending nearly half their length in front of the molars. Teeth very small, conspicuously smaller than in any other species.

Dimensions of the type (measured on the spirit-specimen):—

Head and body 95 mm.; tail 105; hind foot 22; ear 14.

Skull: greatest length 29; condylo-incisive length 26·6; zygomatic breadth 14·5; nasals 10·2; interorbital breadth 4·1; mastoid breadth 11; palatilar length 12·4; palatal foramina 4; upper molar series 4·7.

*Hab.* Lower Fly River, British New Guinea.

*Type.* Old male. B.M. no. 86. 5. 16. 4. Collected by the Rev. S. MacFarlane. Three specimens.

Distinguishable by its small size and extremely small teeth.

XXV.—*Further Notes on the Skull, Brain, and Organs of Special Sense of Diademodon.* By D. M. S. WATSON, M.Sc., Lecturer in Vertebrate Palæontology in University College, London.

WHILST collecting on the farm Winnaarsbaaken, District Albert, Cape Colony, which I visited with the aid of a grant from the Percy Sladen Trustees, I obtained the back of a

small *Diademodon* skull which fits accurately and is a part of Seeley's type-specimen of *Diademodon entomophonus*, collected some twenty-five years before. It is interesting to note that this long exposure cannot at the most have removed more than half a millimetre from the exposed broken face. The matrix is a light green and red mottled cornstone, which, though hard, leaves the bone cleanly. I have been able to completely clean the whole brain-cavity behind the exit of the fifth nerve, and also the inner ears of both sides, that on the right more completely.

Broken surfaces, some of which have been polished, enable one to get a clear idea of the relation of the membrane-bones of the back of the skull to the otic capsule.

The following description should be read in connection with my former description of the *Diademodon* skull.

In front of the small round foramen magnum the brain-cavity expands considerably, forming a large cavity much higher than wide. The floor is slightly concave, and in front is sharply depressed to form the pituitary fossa, whose floor is extremely narrow. The pituitary fossa is flanked on either side by the processi inferiores anteriores of the prootics.

Lying on the extreme back of the skull just above the condyle is the small notch, which is probably for a blood-vessel.

In advance of this at the sides of the base of the brain-case, where the lateral walls turn sharply upwards, are two small foramina lying one in front of the other. These open into the deep pit which was described as the foramen jugulare, the posterior at the extreme back of the pit and the other on the inner wall just in front of it. These foramina are undoubtedly for the twelfth nerve.

Above the posterior hypoglossal foramen is a small foramen opening upwards in the lateral wall of the skull. I have not been able to trace the course of this opening, but think it probably merely venous; it is certainly not a nerve-exit.

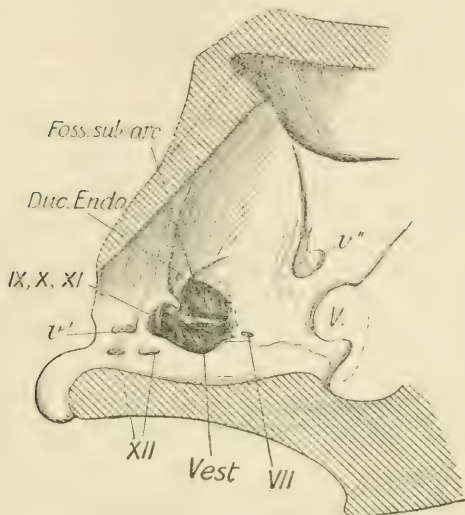
In front of these foramina is a large hole of irregular shape in the wall and base of the brain-case. The posterior part of this is the foramen for the IX., X., and XI. nerves; the rest is the opening into the vestibule.

Immediately in front of the opening lies a very small canal—the aqueductus fallopii—which passes straight downwards through the preotic. Above the internal auditory meatus is a large deep fossa subarcuata: this passes backwards and outwards, and has a smoothly rounded end; it is separated from the ear by a thin horizontal flange of bone,

notched at the back so as to allow of a connection between the two organs.

Above the processus anterior inferior prootici is a notch for the V. nerve, above and in front of which the prootic is

Fig. 1.



Posterior part of the brain-cavity of *Diademodon*, slightly diagrammatized from the type-skull of *D. entomophonus*.  $\times 1\frac{1}{2}$ .

*Duc. Endo.* = opening of the canal for the ductus endolymphaticus into the brain-cavity. *Foss. sub. arc.* = fossa subarcuata. *Vest.* = vestibular cavity. *v'* and *v''*, foramina for veins. *V*, *VII*, *IX*, *X*, *XI*, *XII*, foramina for exit of the corresponding cranial nerves.

carried forward as a long process covered externally by the alisphenoid. In the suture between this part of the prootic and the parietal is a venous foramen opening outward into the sinus-canal.

### *Bones of the Brain-case.*

The basioccipital and basisphenoid are not separated by suture: they are in the cerebellar region very shallow bones, deepening in front until, at the pituitary fossa, the basisphenoid is transformed into a deep narrow plate, which carries the laterally directed basipterygoid processes.

This specimen shows quite clearly that no foramen opens

into the brain-cavity through either of these bones, but from the outer side of the depressions on the lower surface of the basisphenoid, which have already been described, a small canal runs quite laterally and opens on the side of the basisphenoid very near its lower border and below the foramen fallopii. This presumably transmits a blood-vessel.

The exoccipital opisthotic and basioccipital are not separated by clear sutures.

The suture between the basioccipital and the other bones must run either through or just within the two hypoglossal foramina.

The other two bones with the fused supraoccipital form a plate, pierced in the middle by the foramen magnum and notched laterally by the post-temporal fossæ.

A difference in texture of the bone in the specimen of *Diademodon browni* already described renders it probable that the exoccipital is a small bone, forming a good deal of the foramen magnum and extending outwards along the lower and hinder border of the paroccipital process. If this is the case, the outer end of that process is formed by the opisthotic with a splint of pro-otic along its anterior face.

The upper part of the occipital plate is formed by the supraoccipital and the epiotics, which are no doubt fused with it.

The pro-otic is clearly separated by suture from the basisphenoid; it forms the whole of the anterior border of the internal auditory meatus and about half the fossa subarcuata. Its upper border has a suture with the parietal, and its posterior surface is in contact with the opisthotic and "supraoccipital." It forms the anterior part of the vestibule and of the fenestra ovale. It is pierced by the small duct for the VII. nerve.

The relations of the membrane-bones sheathing these cartilage-bones are as follows:—

The interparietal is a thin film of bone covering the back of the occipital plate at the top and projecting above it to articulate with the parietals.

The tabulare is a bone which was regarded in my former account as part of the parietal. It sheaths both anterior and posterior surfaces of the occipital plate, having a sutural connection with the interparietal and extending down outside the post-temporal fossa to touch the end of the opisthotic.

The parietals are fused in the middle line; they articulate behind with the interparietal, and their lateral edges have a suture with the pro-otics and, to a less degree, with the supraoccipital. They send a process outward along the



front of the tabulare, which is itself overlapped by the squamosal.

The squamosal has a large articulation with the end of the opisthotic; it sends a process inward over the post-temporal fossa to cover the front face of the tabulare and part of the parietal. It has also a connection with the pro-tic by the special process, already described, which covers the venous canal between the pterygo-paroccipital and post-temporal fossæ.

In my former description I held the thin plates of bone which cover the anterior parts of the brain and extend backwards to the quadrate in front of the tympanic cavity to be parts of the pterygoid. The present specimen shows conclusively that that view was wrong, and that Dr. Broom was right in considering the whole to be a separate bone—the epipterygoid.

The suture separating the epipterygoid from the pterygoid runs obliquely from the notch in front of the columella cranii to the lower surface of the bones below the foramen for the V. nerve and to the outside of the opening for the internal carotid artery. This condition explains the fact that the relation of the pterygoid flange of the quadrate and the quadrate flange of the epipterygoid is the reverse of that which always occurs between the pterygoid flange of the quadrate and the posterior ramus of the pterygoid.

The process by which the reduction of this posterior ramus of the pterygoid and development of the epipterygoid takes place is clearly illustrated by many "Therocephalian" skulls, where the epipterygoid has an articulation with the basisphenoid and sends a long process back along the upper border of the posterior ramus of the pterygoid.

The epipterygoids extend forward to the middle of the orbits, their lower borders being closely approximated during much of the anterior part.

In transverse section just behind the postorbital bar the upper edge of the epipterygoid is clasped between the frontal, which sends a flange down its inner side, and the postorbital, which covers a good deal of its outer surface.

It seems to be certain that the whole of this long anterior extension is really epipterygoid and that there is no orbitosphenoid.

The structure of the bony labyrinth is very well shown on the right side of the type-skull of *D. entomophonus*; the actual semicircular canals, however, have not been cleared, but are very clearly seen as casts in the type-specimen of *Nythosaurus larvatus*, which agrees closely in structure.

The vestibule lies very low down in the skull, being largely below the bottom of the brain. It is considerably longer than high and wide, its small posterior end being produced backwards and outwards, separated by a thin ridge from the deep groove which transmitted the IX., X., and XI. nerves.

The anterior end is continued as a rather large cavity, the lateral wall of which bears a diverticulum for the ampulla of the horizontal semicircular canal; still further forward is the space for the ampulla of the anterior vertical semicircular canal.

The vestibule is continued up by a special narrow part, which passes into the joint portion of the anterior and posterior semicircular canals. *Nythosaurus* shows all three canals very well. The anterior canal loops over the fossa subarcuata in the normal way, and the chief point of interest seems to be that the ampullæ are very small.

The ductus endolymphaticus has a small foramen to the cranial cavity, which lies just above and behind the fossa subarcuata.

The fenestra ovale lies in the outer and lower wall of the vestibule, and the posterior end of the vestibular space opens by a very large foramen (confluent with the foramen jugularis, from which it is marked off by a distinct process) into the deep pit into which all the posterior cranial nerves open. This large opening is the fenestra rotundata; immediately to the front of it the vestibular space is continued downwards, forwards, and inwards into a long cavum cochlearum. The cochlea was obviously quite long and bent perhaps through a quadrant.

The ear that has been just described resembles that of a mammal, and differs from those of all other types in the following features:—

1. Its inferior position, the vestibule lying very largely below the brain, a character common to all Therapsids in which the condition is known.
2. The small fenestra ovale.
3. The long, anteriorly internally directed, and bent cochlea.

It is surprisingly primitive in the retention of a large opening to the brain-cavity, closed, of course, in life by a membrane.

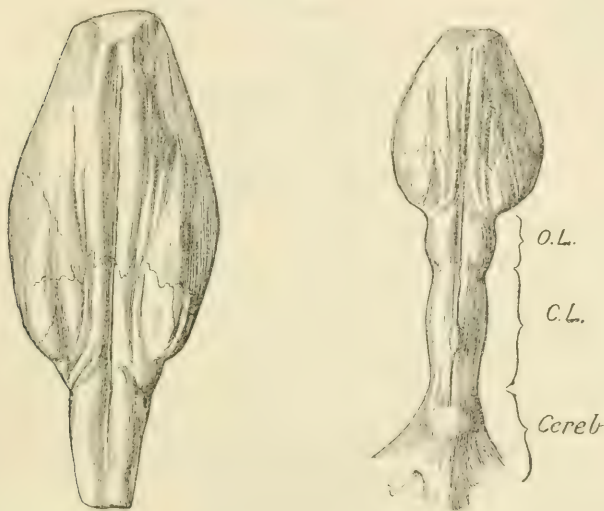
The semicircular canals also are of a very simple type, without any of the specialization so often found in lizards, birds, and mammals.

Taken as a whole, the labyrinth is extraordinarily similar to that of *Ornithorhynchus* in all features.

### *Nasal Cavity.*

The nasal cavity is best examined in two natural casts in ironstone, R. 1713, the type-specimen of *Nythosaurus*, and R. 3767, *Diademodon* sp.

Fig. 2.



Ironstone casts of nasal cavity and parts of brain-case of *Diademodon* (left) and *Nythosaurus* (right).  $\times 1$ .

To show the ridges and furrows associated with the attachment of ethmo-turbinals and the olfactory lobes in *Diademodon* and the whole brain in *Nythosaurus*.

*C.L.*=cerebrum; *Cereb.*=cerebellum; *O.L.*=olfactory lobes.

In both types the nasal cavity is very large. It is distinctly separated from the brain-cavity behind it by a ridge on the under surface of the frontal, and extends from here forwards between the orbits to the nose. The under surface of the frontals, nasals, and prefrontals bears a series of ridges and grooves running longitudinally; these cross sutures without disturbance, and are quite similar in the two genera.

There is a strong ridge down the middle line, on each side

of which is a deep groove, bounded laterally by a distinct ridge. Immediately external to this on the frontal is a smaller groove and ridge, outside which is a pocket in the prefrontal, along the bottom of which is a ridge. On the side of the nasal cavity outside this pocket are three other ridges, making six in all.

This series of ridges and grooves is identical in all features with those on the lower surface of mammalian frontals and nasals which are associated with the attachment of ethmo-turbinals. They seem to me to afford conclusive evidence that *Nyctosaurus* and *Diademodon* possessed a series of unossified ethmo-turbinals on the same plan as such a mammal as *Dasyurus*.

I have not yet found similar evidence of the presence of a maxillo-turbinal, perhaps only on account of inadequate material.

Another feature extremely clearly shown by these two ironstone casts is the course of the naso-lachrymal duct. This opens into the orbit by two foramina in the lachrymal bone, leading into canals, which soon unite and then travel forward still in the lachrymal bone until they open into the nasal cavity on the inner side of the maxilla. These relations are so very similar to those existing in *Peromyscus* between the duct and the lachrymal bone as to leave no doubt that the bone in Cynodonts is homologous with that of the mammal. It is, however, the lower of the two bones usually called lachrymal and prefrontal, and as the Cynodonts are certainly more nearly allied to the mammals than the lizards, it leaves no doubt that Gaupp was not justified in homologizing the reptilian prefrontal with the mammalian lachrymal. Meek, from the conditions in the Crocodile, has already controverted this view, Gaupp having no doubt been misled by the great reduction of the true lachrymal in the types studied by him.

The occurrence of a large deep fossa subarcuata is of great importance, because it shows that the brain in its region and at least to its level filled the brain-cavity, as does that of a mammal. If the brain had not filled the cavity there would be no necessity for providing a special diverticulum for the flocculus.

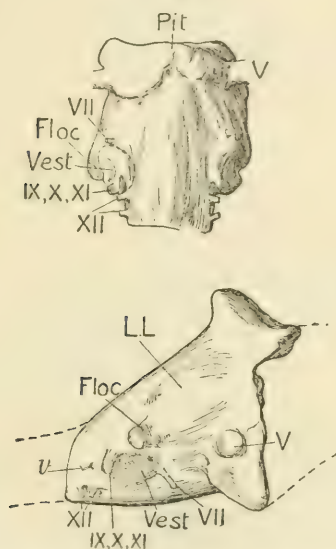
We are thus justified in regarding the lower part of the cerebellar region of the cast of the cranial cavity as a relatively perfect copy of the brain.

The under surface of the medulla is slightly convex in all directions, and is terminated in front by the pituitary, which



is not shown accurately, because the sides of its fossa are widely open for the internal carotids. From the extreme lower edge of this region the two branches of the XII. nerve leave the skull. Above the more anterior of these is the process representing the X. nerve, which leaves relatively high up on the side of the brain and is continuous with the cast of the vestibule.

Fig. 3.



Cast of the posterior part of the brain-cavity of *Diademodon entomophonus*.  
Upper figure, from below; lower figure, right side.  $\times 1$ .

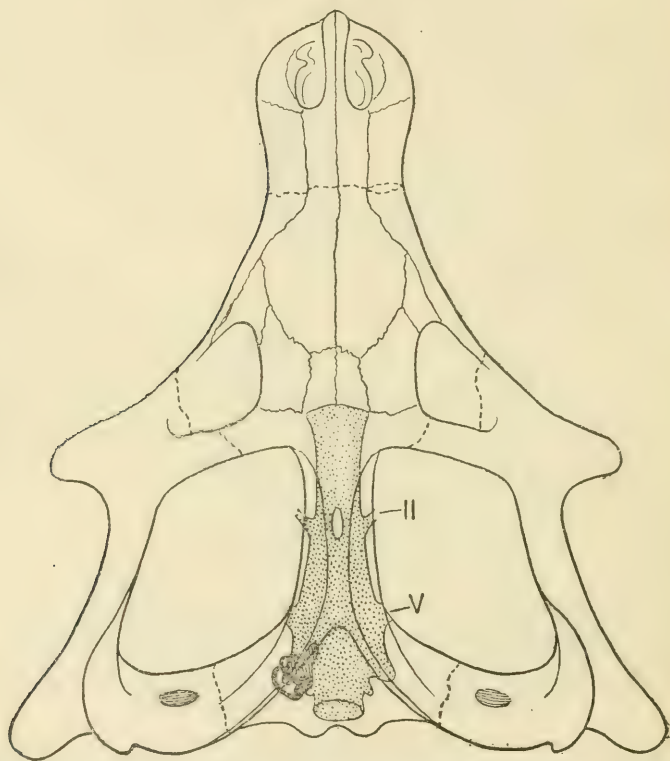
*Floc.*=flocculus; *L.L.*, impression of lateral lobe of cerebellum;  
*Pit.*=pituitary. Other references as before.

In front of this region the brain suddenly expands, the lateral parts being formed by the flocculi, which are very large and directed outward and backward. Study of the cast shows that the cerebellum is very much larger than in any known reptile both laterally and vertically, the lateral lobes being distinctly marked.

Some distance in front of the flocculus is the exit of the V. nerve, placed low down in the skull lateral to the pituitary. The top of the cast in this region certainly does not reproduce the brain.

The brain-case in the region of the optic lobes and cerebrum has not been cleared, but as its lower surface is widely open and the walls the thin plates of the epipterygoid, a cast would not be likely to yield any information of value. The maximum possible breadth of the cerebrum is known, and is very much less than the width across the cerebellum.

Fig. 4.



Skull of *Diademodon entomophonus*, restored. Dorsal aspect.  $\times \frac{2}{3}$ .

Stippled area=cavity for the brain; lined area=vestibule and its processes; semicircular canals black.

The ironstone cast R. 3767 shows the front of the brain quite well; the thin plates of epipterygoids which enclose it very nearly meet in the ventral line, and the upper surface

of the cast is very distinctly divided into two smooth rounded masses, which probably reproduce the olfactory lobes with some accuracy; if this is so, they are relatively very large, in correlation no doubt with the large nasal cavity with an elaborate series of turbinals.

Taken as a whole, the marked features of the brain are:—

1. The ventral position of the exits of the nerves.
2. The very great development of the cerebellum and the presence of a large flocculus.
3. The great length and narrowness of the cerebrum.
4. The large olfactory lobes.
5. The fact that the cerebellum fills its cavity.

Fig. 5.



*Diademodon entomophonus*. Brain-case in sagittal section, with the ear and front edge of the epipterygoid projected on to it.  $\times \frac{2}{3}$ .

The stippled area represents the probable area occupied by the brain; where it rests on an unbroken line the brain-cavity is floored.

*Fen.ov.*=fenestra ovale; *Fen.r.*=fenestra rotunda

The type-specimen of *Nythosaurus larvatus* gives a good cast of the brain, which differs from that described above in *Diademodon* only in being relatively large (no doubt on account of its smaller size) and in having larger olfactory lobes.

It is an interesting fact that in *Dicynodon* there is in one specimen a very shallow depression in a position corresponding to the fossa subarcuata in *Diademodon*. This suggests that the tendency to a great development of the cerebellum was common amongst Therapsids.

The very remarkable size of the cerebellum in *Diademodon* is, perhaps, to be correlated with the advanced type of limb found in that group, where the characters of the humerus and genoid cavity suggest that the fore limb was carried somewhat like that of a higher mammal, with the feet not very distant from the middle line, whilst in *Dicynodon* and other early types and also in the living Monotremes they are very widely separated, and the animal's gait was certainly very slow and uncertain.

In any case the *Diademodon* brain suggests very strongly that in mammalian ancestors the first part of the brain to be specialized was the cerebellum, which is associated with the coordination of muscular movements, and that the cerebrum, whose function is different, was of much later development.

This view is in strict accordance with the fact that all early and primitive mammals have very large cerebella in proportion to the rest of the brain, and that in later types the cerebrum increases much more rapidly than the other regions.

Many of the differences between a mammal and a reptile—the soft skin, the increased body-temperature, the hair and all it implies, the more perfect joints in the limbs—are directly connected with increased activity and precision of movement, and these in turn are dependent on cerebellar improvement.

The importance of the *Diademodon* brain, ear, and nose lies in the evidence which they afford that this change was actually taking place in the Therapsids, and that it is to all appearances a very gradual one and may to a large extent have preceded the development of a mammalian structure.

I wish to express my thanks to the Percy Sladen Trustees and to Mr. J. Strydom, of Winnaarsbaaken, to whose hospitality I am indebted for the opportunity of collecting the specimen.

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XXVI.—*Note on Myxine capensis.*

By C. TATE REGAN, M.A.

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*MYXINE CAPENSIS* was recently described by me from a single specimen from the Cape of Good Hope, taken at a depth of 110 fathoms ('Annals,' (8) xi. 1913, p. 398). The dentition could not be described, and it was not certain that the presence of seven pairs of branchial pouches was normal and characteristic of the species. Dr. L. Peringuez, Director of the South African Museum, has very kindly sent me two examples of the Cape hag-fish, taken off Cape Point at a depth of 175 fathoms. Both have seven branchial pouches and ten teeth in each series, the two most anterior united. The larger measures 320 mm. (93 mm. to the branchial aperture) and the smaller 250 mm. (73 mm. to the branchial aperture). The pores number  $31 + 67 + 10$  and  $30 + 64 + 12$  respectively.

*Myxine capensis* is nearest to *M. australis*, Jenyns, from Chile and Patagonia, but differs from that species (and from all others of the genus) in having seven pairs of branchial sacs instead of six.

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XXVII.—*A new Species of the Crustacean Genus Thaumastocheles.* By W. T. CALMAN, D.Sc.

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*THAUMASTOCHELES ZALEUCUS* (Willemoes-Suhm), one of the most remarkable of deep-sea Crustacea, was described from a single perfect female specimen and fragments of a second which were dredged by the 'Challenger' off Sombrero Island, West Indies, at a depth of 450 fathoms. In 1906 Dr. Doflein referred to the same species a male specimen from Sagami Bay, Japan, and four years later Miss Rathbun recorded a female from a depth of 350 fathoms in the same locality. Dr. Doflein mentions that Mr. Owston, the well-known dealer in Yokohama, from whom his specimen was obtained, had previously sent another to England. This refers, in all probability, to a specimen now in the Zoological Museum of the University of St. Andrews, to which my attention has been called by Prof. W. C. M'Intosh, F.R.S. I am greatly

indebted to Prof. M'Intosh for allowing this precious and fragile specimen to run the risks of a journey to London, in order that I might compare it directly with the 'Challenger' type. The result has been to show that the West-Indian and Japanese forms are quite distinct, though closely allied, species. Brief summaries of their distinctive characters are given below, followed by some more detailed notes on the St. Andrews specimen.

*Thaumastocheles zaleucus* (Willemoes-Suhm).

*Astacus zaleucus*, Willemoes-Suhm, in Wyville Thomson, Nature, viii. 1873, p. 247, fig. 1; Milne-Edwards, Ann. Sci. Nat., Zool. (5) xix. 1874, Art. 7, 2 pp., pl. xx.; Willemoes-Suhm, Trans. Linn. Soc. London, ser. 2, Zool. i. 1875, p. 48, pl. x. fig. 1.

*Thaumastocheles zaleucus*, Wood-Mason, Proc. Asiatic Soc. Bengal, 1874, p. 181; Spence Bate, Rep. 'Challenger' Macrura, 1888, p. 47, pls. vi., vii. fig. 1.

Third segment of antennular peduncle more than  $1\frac{1}{2}$  times as long as second, its width less than half of its length. Penultimate segment of antennal peduncle extending well beyond tip of scale, more than twice as long as distal segment. Spiniform teeth on fingers of larger cheliped inclined alternately to either side of the plane in which the fingers lie. Palm of smaller cheliped more than half as long as fingers. Dactylus of second and third peraeopods two-thirds of length of upper border of palm.

*Holotype*: female, total length (rostrum to telson) 110 mm., from 'Challenger' Station 23, off Sombrero Island, West Indies, 450 fathoms (Brit. Mus. Crustacea, reg. no. 88. 22). *Paratype*: chelipeds (first pair) and left third maxilliped of another individual from the same locality.

*Thaumastocheles japonicus*, sp. n.

*Thaumastocheles zaleucus*, Doflein, Zool. Anz. xxx. 1906, p. 521, figs. 1-4; Rathbun, Bull. Mus. Comp. Zool. Harvard, lii. 1910, p. 314, pl. vi.

Third segment of antennular peduncle hardly longer than second, its width more than two-thirds of its length. Penultimate segment of antennal peduncle just reaching tip of scale, one and a half times as long as distal segment. Spiniform teeth on fingers of larger cheliped lying in the plane of the fingers. Palm of smaller cheliped less than half as long as the fingers. Dactylus of second and third peraeopods equal or nearly so to upper border of palm.

*Holotype*: female, total length 174 mm., in Zoological

Museum of University of St. Andrews, "Off Yenoshima, Odawara Bay, Japan, 200 fathoms, July 1898, Mr. W. Balsillie." Length of carapace and rostrum 62 mm.; of larger chela 118 mm.; of smaller chela 56 mm. This specimen is the largest yet recorded in the genus.

The spines on the antero-lateral regions of the carapace are more numerous than in *Th. zaleucus*. The raised line which marks the anterior margin of the carapace shows on each side of the base of the rostrum an orbital bay, which, however, is smaller and more concealed by overlying fur than in the type of *Th. zaleucus*. The rostrum is turned upwards at the tip, not downwards as in Doflein's specimen, and there are about five pairs of marginal spinules concealed in the shaggy fur that covers it. The dorso-lateral ridges of the abdomen, which in *Th. zaleucus* are dentate or tuberculate on all the somites, are so here only on the first three, becoming low and smooth on the last three somites.

The arrangement of the teeth on the fingers of the larger cheliped requires further description. In *Th. zaleucus* (fig. I.) the teeth are set in a single row—that is to say, with their bases in line—for the greater part of the length of the fingers, but they slope alternately to either side of the plane in which the two fingers lie, so as to form two rows at an angle of about  $30^\circ$  with each other. Towards the proximal end of the fingers the bases of the two rows begin to move apart, and the arrangement becomes truly biserial. Throughout the greater part of each row large and small teeth alternate in regular order, so that the periodic arrangement, taking both rows together, may be represented by the formula  $A A B B A$ .

In *Th. japonicus* (fig. II.), on the other hand, the teeth are in a single row, and all lie in the plane of the fingers; they are of four orders of size, and are arranged with beautiful regularity (which only becomes disturbed towards the base and tip of each finger) in periodic sequence agreeing with that observed by Stahr\* and by Herrick† in the chelæ of the lobster. The sequence may be represented by the formula  $A D C D B D C D A$ . At the proximal end of the immovable finger is a single tooth set out of the line of the others and pointing obliquely towards the side that is ventral when the chela is extended. This tooth apparently corresponds to one

\* Jenaische Zeitschr. xxxiii. 1898, p. 457.

† Bull. Bureau Fisheries, Washington, xxix. 1909, p. 260





common lobster, is probably a *thelycum* or *receptaculum seminis*. It resembles that of the lobster \* in general form, but differs a little in the two species. In *Th. zaleucus* the posterior unpaired lobe (no doubt the "triangular pectoral plate" of Willemoes-Suhm's account) is relatively large and its anterior angle is acute, while the anterior paired lobes are depressed in the middle line; in *Th. japonicus* the posterior lobe is smaller, its anterior angle is obtuse, and the anterior lobes are elevated in the middle. It is possible, however, that these differences may not be specific, but may be due to differing degrees of maturity.

# XXVIII.—Descriptions of new Species of Mollusca.

By G. B. SOWERBY, F.L.S.

[Plate III.]

THE eight Japanese species described in this paper, together with the six appearing in my last (Ann. & Mag. Nat. Hist., June 1913), were collected and sent over by Mr. Y. Hirase, whose diligent researches have added much to our knowledge of the molluscan fauna of Japan. He has also recently built and furnished an excellent conchological museum at Kyoto.

## *Glyphostoma glabriplicatum*, sp. n. (Pl. III. fig. 1.)

Testa elongata, albida, solidiuscula; spira elato-turrita; anfractus 9, convexi, gradati, spiraliter subtilissime striati, longitudinaliter plicati; plicis 8, crassiusculis, rotundatis, glabratis; anfractus ultimus brevis, infra contractus, brevirostratus; apertura brevicula; peristoma ad marginem acutum, extus crassivaricosum, intus plicatum; sinus posticus arcuatus, medioeriter profundus, latiusculus; columella rectiuscula, leviter plicata; canalis brevis, infra expansus.

Long. 14, maj. diam. 4 mm.

*Hab.* Osumi, Japan.

Shell with a short body-whorl and high turritid spire; the outer lip thickened by a strong varix, edge acute, interior of the aperture on both sides closely plicate.

In its general aspect this shell is very like *G. alicie*

\* Calman, "Crustacea," Lankester's 'Treatise on Zoology,' 1909, p. 291, fig. 169.

(Melvill and Standen), from Lifu, but it is much smoother, the spiral striæ being very fine and close.

*Drillia solicitata*, sp. n. (Pl. III. fig. 2.)

Testa elongata, solidiuscula, pallide carnea, dilute fulvo fasciata; anfractus 7, superne glabrati, leviter concavi, infra convexi, oblique plicati; anfractus ultimus spiram fere æquans, supra breviter oblique plicatus, deinde lævis, infra attenuatus, vix rostratus; apertura oblonga, medioeriter lata, intus lævis; peristoma acutum, arcuatum; sinus profundus, intus rotunde expansus; canalis latus, brevissimus; columella leviter arcuata, supra callosa.

Long. 14, maj. diam.  $5\frac{1}{2}$  mm.

*Hab.* Goto, Japan.

A pale pink shell, with light fulvous bands; it is chiefly remarkable for the character of the sinus, which is rather narrow at the entrance and then roundly expanded.

*Mangilia osumiensis*, sp. n. (Pl. III. fig. 3.)

Testa fusiformis, sordide albida, obscure luteo fasciata; spira elata, acuta; anfractus 7, convexiusculi, spiraliter densissime striati, longitudinaliter plicati; plicis 8, rectiusculis vel leviter obliquis, crassiusculis; anfractus ultimus spiram superans, supra convexus, infra attenuatus; apertura oblonga, medioeriter lata; peristoma acutum; sinus brevissimus; canalis latiusculis, curtus.

Long.  $4\frac{1}{2}$ , maj. diam. 2 mm.

*Hab.* Osumi, Japan.

A typical *Mangilia*, distinctly spirally striated.

*Cythara quadrilineata*, sp. n. (Pl. III. fig. 4.)

Testa fusiformi-ovata, solidiuscula, albida, lineis 4 pallide fulvis transversim ornata; spira acute conica, leviter convexa; anfractus 5, læves, plicis paucis glabratiss longitudinaliter instructi; anfractus ultimus longitudinis  $\frac{2}{3}$  testæ æquans, supra convexus, infra attenuatus; apertura angusta; peristoma crassum, intus denticulatum; sinus haud profundus; columella rectiuscula, minute denticulata; canalis brevis, medioeriter latus.

Long. 8, maj. diam.  $3\frac{1}{4}$  mm.

*Hab.* Japan.

A smooth shell without spiral striæ, the longitudinal plicæ being somewhat distant, and smoothly rounded. The four light fulvous lines crossing the body-whorl seem to be a constant character.

*Clathurella excellens*, sp. n. (Pl. III. fig. 5.)

Testa ovato-turrita, alba, luteo tineta, fulvo-fusco hic illic paucimaculata; spira elatiuscula, gradata; anfractus 6, supra angulati, longitudinaliter rugose plicati; plicis 8, nodulosis; anfractus ultimus spiram superans, supra nodose angulatus, infra contractus, breviter rostratus; apertura oblonga, angustiuscula; peristoma crassum, intus denticulatum; sinus posticus mediocriter profundus, rotunde curvatus; columella recta, fere laevis; canalis brevis, antice expansus.

Long. 10, maj. diam. 4 mm.

*Hab.* Osumi, Japan.

A small shell of a striking and somewhat gay character. The nodules on the ribs are quite prominent, mostly of a pale yellow colour, but here and there they are ornamented with conspicuous bright brown blotches, sparingly distributed.

*Clathurella royi*, sp. n. (Pl. III. fig. 6.)

Testa ovato-turrita, crassa, pallide luteo-fulva, ad apicem fusca; spira elatiuscula, subgradata; anfractus 8, primi 2 laeves, sequentes convexi, supra angulati, longitudinaliter plicati; plicis crassis, rotundatis, valide nodulosis; anfractus ultimus spiram fere æquans, supra convexus, angulatus, infra contractus, brevissime rostratus; apertura mediocriter angusta; peristoma crassum, intus denticulatum; sinus mediocriter latus et profundus; columella leviter sinuosa, haud denticulata; canalis brevis.

Long. 7, maj. diam. 3 mm.

*Hab.* Osumi, Japan.

A small shell of solid growth, with very stout, strongly nodulous ribs, brown apex. Otherwise the shell is of a light uniform buff-colour.

*Conus optimus*, sp. n. (Pl. III. fig. 7.)

Testa turbinata, crassa, fusca, maculis grandibus albis diversiformibus ornata; spira breviter conica; anfractus angulati, anguste planulati, ad angulum tubereulati; anfractus ultimus ad angulum tuberculis rotundatis mediocriter elevatis subdistantibus coronatus, infra angulum convexiusculus, baltea alba irregulariter interrupta infra medium ornatus, basin versus leviter attenuatus, granulatus; apertura angusta, intus purpurea; peristoma postice breviter sinuata.

Long. 23, maj. diam. 12 mm.

*Hab.* New Caledonia.

The pattern of this shell is rather excentric; there is a large, white, curiously formed blotch proceeding diagonally

from the angle, and just below the middle of the body-whorl an interrupted belt of quaintly formed white markings; these show very prominently against the general plain brown colour of the shell.

I have only seen a single specimen of this species.

*Chrysodomus acutispiratus*, sp. n. (Pl. III. fig. 8.)

Testa ovato-acuminata, luteo-albida, pallide fusco-balteata, ubique spiraliter lirata, liris angustis, confertis, liris fortioribus majis distantibus interveniens; spira elata acuta, apice papillaris; anfractus 9, primi 2 laeves, leviter obliqui, sequentes 4, angulatim convexi, longitudinaliter nodoso-plicati, deinde regulariter convexi; anfractus ultimus spiram superans, ventricosus infra medium valde contractus, breviter contorto rostratus; apertura ovata, intus laevis, fusco-tincta; peristoma tenue, arcuatum; columella arcuata, infra medium complicata, sinistrorsum reflexa; canalis brevis, leviter reflexus.

Long. 29, maj. diam. 13 mm.

*Hab.* Iyo, Inland Sea, Japan.

This shell is remarkable for its long acute spire, the spiral, close, fine liræ, with stronger ones at regular intervals, and the rough plicæ on the upper whorls.

*Mesalia exilis*, sp. n. (Pl. III. fig. 9.)

Testa elongato-turrita, albida, maculis parvis pallide lutescente conspersa, ubique spiraliter tenuiter lirata; spira prælonga, acuta; anfractus 14, leviter convexi, oblique anguste plicati, plicis granulosis; sutura anguste canaliculata; anfractus ultimus  $\frac{1}{3}$  longitudinalinis testæ æquans, convexus, plicis obliquis evanidis; apertura semilunata; peristoma tenue; columella sinistrorsum reflexa; basis haud canaliculata, sinu latiusculo emarginato.

Long. 47, maj. diam.  $13\frac{1}{2}$  mm.

*Hab.* West Australia.

The actual generic position of this remarkable shell is uncertain, but I place it provisionally in *Mesalia* on account of the characteristic basal sinus.

*Mitra marciæ*, sp. n. (Pl. III. fig. 10.)

Testa ovato-fusiformis, albida, lineis lacteis, vivide fusco interruptis ornata; spira mediocriter elata, acuta; anfractus 8, convexi, longitudinaliter ubique plicata, supra pallide luteo tincti, linea fusca luteo interrupta ornati; anfractus ultimus  $\frac{2}{3}$  longitudinalinis testæ æquans, convexiusculus, infra leviter attenuatus, ad medium, supra, et infra hilariter lineatus; apertura oblonga, intus fusco fasciata; columella triplicata.

Long. 16, maj. diam. 6 mm.



*Hab. Cyo-Callamianes, Philippines (Hidalgo).*

A beautiful little shell; the lines crossing it are bright brown between the ribs and yellow on the top; the anterior portion of the shell is more densely marked with brown lines.

I have only seen one specimen, which was sent to me by Señor J. G. Hidalgo, of Madrid.

*Mitra hidalgoi*, sp. n. (Pl. III. fig. 11.)

Testa gracillime elongata, albida, hic illic sparsim flavo tineta; spira elata, acutissima; anfractus 9, primi 2 læves, pellucens, sequentes tricarinati, inter carinas longitudinaliter foveolatum multisulcati; anfractus ultimus  $\frac{2}{3}$  longitudinis testæ æquans, levissime convexus, carinis circiter 12 instructus, basin versus attenuatus; apertura angusta; peristoma tenue, serratum; columella triplicata.

Long. 19, maj. diam.  $5\frac{1}{2}$  mm.

*Hab. Philippines (Hidalgo).*

A shell of graceful slender form, with prominent spiral carinæ, between which are numerous short excavated sulci directed longitudinally.

Like the last species, this is the only specimen I have seen, and it was also sent me by Señor Hidalgo.

*Mitra sculptispira*, sp. n. (Pl. III. fig. 12.)

Testa ovato-fusiformis, solidula, nigro-fusca, baltea unica luteo-fusca ornata; spira conica, mediocriter elata, acuta; anfractus 7, convexi, longitudinaliter plus minusve rugose plicati; sutura impressa; anfractus ultimus levis,  $\frac{2}{3}$  longitudinis testæ æquans, supra convexus, supra medium baltea angusta luteo-alba cingulatus, infra leviter attenuatus, oblique sulcatus; apertura angusta; peristoma crassiusculum, levis, nigro-fusca; columella rectiuscula, triplicata.

Long. 14, maj. diam. 6 mm.

*Hab. I. Sibuyan, Philippines (Hidalgo).*

Four specimens of this species to hand. It is a dark brown shell, with a thin band of yellowish white; the body-whorl is smooth, but the upper whorls are more or less rudely plicate; in this respect the specimens vary considerably.

*Tellina eusculpta*, sp. n. (Pl. III. fig. 13.)

Testa ovalis, compressa, albida, concentricè tenuiter dense laminata, radiatim subtiliter sulcata, antice rotundata, postice leviter truncata, leviter flexuosa; umbones acuti, fere centrali, conjuncti; lunula angustissima; ligamentum breviusculum; area ligamenti

excavata ; margo dorsalis utrinque declivis ; latus anticus rotundatum, posticus biangulatum ; cardo normalis.

Diam. antero-post. 26, umbono-marg. 16 mm.

*Hab.* Manila.

A white shell of ordinary form, closely sculptured, with thin concentric lamellæ and radiating striæ.

*Cardita kiiensis*, sp. n. (Pl. III. fig. 14.)

Testa transverse oblongo-ovata, compressiuscula, fulvo-fusca, supra albo picta, versus marginem tenuiter concentrice striata, ubique oblique costata ; costis 12, latiusculis, rotunde convexis, interstitiis subæqualiter latis ; umbones incurvati, approximati, antice locati ; margo dorsalis posticus elongatus, leviter arcuatus, anticus abrupte truncatus, utrinque rotunde convexus, ventralis leviter arcuatus ; cardo normalis ; pagina interna lævis, alba, ad marginem crenulata.

Diam. umbono-marg. 21, antero-post. 29 mm.

*Hab.* Kii, Japan.

This shell is chiefly remarkable for the extremely anterior position of the umboes, making the radiating ribs unusually oblique.

*Cardita regularis*, sp. n. (Pl. III. fig. 15.)

Testa subtrigonalis, ventricosa, crassa, fusca, radiatim costata ; costis 12, latiusculis, transversim rugose plicatis, interstitiis majis angustis lævigatis ; umbones obtusi, ante medium locati ; area valvarum antica oblongo-cordiformis, leviter concava, postica elongata, compressa, utrinque rugose striata ; margo dorsalis anticus brevis, valde declivis, posticus elongatus recto declivis ; latus anticus rotundatum, posticus acuminatum, biangulatum. Pagina interna lilacco-fusco tineta, margine crenulata ; impressiones musculares utrinque ovali, impressi.

Diam. umbono-marg. 30, antero-post. 40, crass. 25 mm.

*Hab.* Gorée, West Africa.

Compared with *C. antiquata*, Linn., the form of this shell is more triangular, umboes more nearly central, radiating ribs more strongly plicate, interstices not so deep. It is further distinguished by the shallow depressions before and behind the umbones.

I have only seen one adult and two young specimens, which were in the collection of the late Monsieur Denans, with label indicating habitat as above.

## EXPLANATION OF PLATE III.

- Fig. 1. *Glyphostoma glabriplicatum* (twice nat. size).  
 Fig. 2. *Drillia sollicitata* (twice nat. size).  
 Fig. 3. *Mangilia osumiensis* ( $3\frac{1}{2}$  times nat. size).  
 Fig. 4. *Cythara quadrilineata* (twice nat. size).  
 Fig. 5. *Clathurella excellens* (twice nat. size).  
 Fig. 6. — *royi* ( $2\frac{1}{2}$  times nat. size).  
 Fig. 7. *Conus optimus* (nat. size).  
 Fig. 8. *Chrysodomus acutispira* (nat. size).  
 Fig. 9. *Mesalia exilis* (nat. size).  
 Fig. 10. *Mitra marcie* (twice nat. size).  
 Fig. 11. — *hidalgoi* ( $1\frac{1}{2}$  times nat. size).  
 Fig. 12. — *sculptispira* (twice nat. size).  
 Fig. 13. *Tellina eusculpta* (nat. size).  
 Fig. 14. *Cardita kiiensis* (nat. size).  
 Fig. 15. — *regularis* (nat. size).

## PROCEEDINGS OF LEARNED SOCIETIES.

## GEOLOGICAL SOCIETY.

February 5th, 1913.—Dr. Aubrey Strahan, F.R.S., President,  
 in the Chair.

The following communication was read:—

‘On the Skeleton of *Ornithodesmus latidens*, an Ornithosaur from the Wealden Shales of Atherfield (Isle of Wight).’ By Reginald Walter Hooley, F.G.S.

The bones were obtained from blocks recovered from the sea after being washed from a huge fall of the Wealden Shales. Portions of the skeleton missing in the Atherfield specimens are supplemented by bones in the British Museum (Natural History), No. R.176, upon which the late Prof. H. G. Seeley founded the genus. There are remarkable peculiarities in the skull which isolate it from all known families, such as the presence of a sixth vacuity and a transposition of the jugal and quadratojugal in regard to the supra- and infra-temporal arcades. The jugal is excluded from the upper arch, and the jugal and quadratojugal from the lower, which is formed entirely by the quadrate. The orbits are placed far back in the skull, and the quadrate articulation is much in front of them. The occiput is concave. Teeth occur only at the extremity of the long muzzle; they are set close together, and those of the upper jaw interlock with those of the lower jaw. The notarium, the humerus, the decussation of the ulna by the radius, the sternum, and femur all show divergence from other types.

The wonderful preservation of the bones enables the mechanism of the skull, joints, and movements of the limbs to be described.

The paper deals with the morphology, and institutes comparisons with other types.

The evidence proves that it is necessary to form a new family, and that *Ornithodesmus* has descended from a sub-order which should include *Scaphognathus* and *Dimorphodon*. The Author suggests the withdrawal of these two genera from the Rhamphorhynchidæ, and the formation of a new sub-order; and also that there are three entirely different phases of development shown in the skulls of the known Ornithosauria, which permit of their division into three sub-orders.

Measurements of the bones are given.

March 5th, 1913.—Dr. Aubrey Strahan, F.R.S., President,  
in the Chair.

The following communications were read :—

1. 'The "Kelloway Rock" of Scarborough.' By S. S. Buckman, F.G.S.

The Author has studied the types of ammonites from the Kelloway Rock described by Leckenby, preserved in the Sedgwick Museum, Cambridge, and a series of Yorkshire Kelloway-Rock ammonites from the Museum of Practical Geology, London. He has grouped these ammonites according to their different matrices, and finds that they indicate several different zones. These zones he arranges in sequence, and suggests how they may be compared with the sections of Kelloway Rock of Scarborough given by Leckenby and by Fox-Strangways. The exact order of the zones is, in one or two cases, not considered to be proved, but the paper is offered with the idea of indicating where further work is required.

An examination of the ammonite fauna of the Yorkshire zones shows that the so-called 'Kelloway Rock' of Yorkshire is in part contemporaneous with the Oxford Clay of the Midlands and the South of England, and in part contains faunal facies not represented in these areas, but peculiar to Yorkshire so far as England is concerned; they show, however, some affinity with faunal facies in Russia and in Normandy.

An examination of the list of species of ammonites recorded by Fox-Strangways from the Oxford Clay of Yorkshire shows that the Oxford Clay of Yorkshire itself is not in the main sequential to the Kelloway Rock, but is contemporaneous with it, leading to the inference that even in Yorkshire itself part of the Kelloway Rock is only a local manifestation, and that it passes laterally into Oxford Clay.

A table of zones is given, in order to illustrate the contemporaneity of the Kelloway Rock-Oxford Clay deposits of Yorkshire and the



Midlands, while at the same time showing the various non-sequences in both areas.

Some critical palæontological remarks are made concerning the identification of certain species of ammonites, and a correction of nomenclature is made, with a new name for a species misidentified on account of homœomorphy. This leads to a few remarks on development and homœomorphy, wherein an important difference in the mode of development of certain Kelloway Rock-Oxford Clay genera is pointed out, and it is remarked that there are three methods of homœomorphy—(1) subparallel, the likeness of stocks passing through similar stages; (2) transversal, the likeness of stocks starting from different forms meeting at a cross-over or collision-point; and (3) cyclical, the likeness of an anagenetic to a catagenetic series.

2. 'On Jurassic Ammonites from Jebel Zaghuân (Tunis).' By Leonard Frank Spath, B.Sc., F.G.S.

Jebel Zaghuân, the best-known and most conspicuous, though not the highest, mountain of the Tunisian Atlas, is built up largely of massive bluish-grey limestones of confused stratification which have been referred to the Middle Lias on the evidence of badly-preserved belemnites and *Terebratulæ*, notably '*Pygope*' *aspasia*, (*Columna* sp. Middle Liassic (Domerian) ammonites are now recorded for the first time. A new classification of the Domerian genera of the family Hildoceratidæ, to which the fossils from Jebel Zaghuân belong, is proposed.

Moreover the ammonites collected by the Author afford sufficient evidence of the presence of the zone of *Reineckia anceps*, which occurs in Algeria, but had been supposed absent in Tunis together with the other beds intervening between the Middle Lias and the Corallian. The Middle Jurassic transgression must, therefore, have begun in Lower Oxfordian times, since the deposits of that age probably rest directly on the Domerian.

The upper zones of the Oxfordian, as well as the lower part of the Corallian as interpreted by Mr. Buckman: that is, the *cordatus* and pre-*cordatus* zones, seem to be absent, although there is a possibility that they have been cut out by the extensive faulting, of which the general calamitization seems to afford proof.

On the other hand, the Argovian, or zone of *Peltoceras transversarium*, is very well represented. About seventy specimens were collected at a locality called Sidi Bu Gubrin, but the list includes forms from the *transversarium* zone mixed with some from the '*acanthicus*' beds. If we call to mind the curious fact that, not only in the Southern Alps, but also in Sicily the Argovian is very well developed, to the exclusion of the higher beds of the Corallian, followed without any apparent break by the '*acanthicus*' beds, it appears quite probable that the two 'zones' occur here in a similar manner, and that the apparent mixture is not due to doubtful identifications of badly-preserved specimens.

Most of the forms are certainly of Argovian age, and with regard to the remainder the stratigraphical value is problematical. The presence of the '*acanthicus* zone,' therefore, must remain doubtful, although on the neighbouring Jebel Ben Saïdan deposits of that age occur, and indicate a third transgression in Central Tunis during Kimmeridgian times, which brought back the sea and gave rise to deposits of red ammonitic Knollenkalk exactly similar to that of the Lower Oxfordian and the Argovian.

March 19th, 1913.—Dr. Aubrey Strahan, F.R.S., President,  
in the Chair.

The following communications were read:—

1. 'The Geology of Northern Peru: Tertiary and Quaternary Beds.' By Beeby Thompson, F.G.S., F.C.S.

This paper deals with the physiography, physical history, and geology of some 600 square miles of territory in the westernmost part of South America, between the 4th and 5th degrees of south latitude, and between the Andes and the sea.

The connexion between the surface-configuration of the district and the arid nature of the climate is shown.

A description is given of the tablazos, raised beaches, quebradas, and salinaš, etc.

Then follows a physical history of the region, as told by the rocks themselves, from early Eocene times to the present. A great uplift and folding of the rocks took place in late Oligocene or early Miocene times, followed by a comparatively short terrestrial epoch. A subsequent depression allowed of the deposition of Miocene and possibly later beds.

In what may be considered as recent ages the area has been spasmodically rising. It is shown that the elevation of the near Andes is a comparatively recent event.

The series of rocks exposed probably attain a thickness of 5000 feet or more. The whole is divided into four groups of formations—Recent, Miocene, Oligocene(?), and Eocene, and each of these into sets of beds.

By far the most important of these groups of formations is the Eocene, in part corresponding to the Tejon of the Coalinga district of California. This yields abundance of fossils, and is the only series of beds that yield oil. Eight palæontological zones in this series are established. About 150 species of fossils are recorded, of which the larger proportion are probably new species.

The origin of the petroleum is traced to animal organisms.

2. 'The Internal Cranial Elements and Foramina of *Dapedius granulatus*, from a Specimen recently found in the Lias at Charmouth.' By George Allan Frost, F.G.S.

The specimen described was found near the formation known as 'the fish-bed,' in the *semicostatus* zone between Charmouth and

Lyne Regis, and was embedded in an ovoid nodule of indurated Lias.

Owing to the complete envelopment of the skull and its subsequent pyritization, the bones and delicate interorbital septum are preserved in perfect condition, permitting the accurate delineation of the openings for the nerves. The bones apparently are completely ossified, and the entire build is massive, the heavy outer cartilage-bones receiving support internally from the well-developed orbitosphenoids. The supraoccipital, which alone exhibits signs of erosion, shows clearly the bony texture.

There is no foramen in the parasphenoid in front of the basi-pterygoid processes, as in *Lepidotus*.

The basiscranial canal differs from that in *Amia calva*, in its extension to the rear of the skull, that in *Amia* ending in a cul-de-sac half way.

The third, fourth, and fifth nerves in *Dapedius* have their most probable entry through a large median opening between the orbitosphenoids, and not as in *Amia* from the basiscranial canal.

The opisthotics are stout and prominent bones, with an upward inclination corresponding to that of the parasphenoid.

The foramina for the optic and olfactory nerves are clearly shown, the latter nerve having been exposed for about two-fifths of its course across the orbit, thereby differing from *Amia* and *Lepidotus*, in both of which it is enclosed in canals.

There are two openings between each orbit and the nasal fossa.

The basioccipital exhibits a small condyle on each side, and is produced posteriorly in a process above the entrance for the notochord.

April 9th, 1913.—Dr. Aubrey Strahan, F.R.S., President,  
in the Chair.

The following communications were read:—

1. 'The Variation of *Planorbis multiformis* Bronn.' By George Hickling, D.Sc., F.G.S., Lecturer in Palaeontology & Demonstrator in Geology in the Victoria University of Manchester.

The writer gives an account of an investigation of the above-named Miocene gasteropod, based on a suite of 532 specimens from a single block of stone. The shells of this type from the Steinheim deposits were formerly investigated by Steinmann, Hilgendorf, Hyatt, and others. Many species and subspecies were founded by those writers, who also constructed genetic series which were described as following a stratigraphical sequence. The specimens considered in the present paper include several of the species and subspecies of Hyatt. Since, however, these individuals were clearly all living together, and all the types appeared to pass one into the other by insensible gradations, it seemed doubtful whether they could properly be regarded as constituting more than a single

species. Accordingly a study was made of the variation in height presented by the shells, which include every gradation between perfectly discoid forms and types with a spire the height of which considerably exceeds the diameter of the base. By sorting the whole of the shells into ten grades, according to height, it was shown that forms of mean height were common, while extreme forms were rare, the height being distributed, in fact, according to a typical 'variation-curve.' If more than one species were really present, it is in the highest degree improbable that the various types should be distributed in the proportions actually found, and this is taken as the most satisfactory proof possible of the specific unity of the group.

It is shown that the shells also vary extensively in respect of the amount of carination, the degree of involution, the form of cross-section of the whorls, the form of aperture and the stage of development at which various characters are acquired, the variation in each character being, however, 'continuous.' The ontogeny of the various characters is considered, and the species is shown to be highly variable at an early stage, the mature characters being largely independent of early variations.

A discussion is given of the bearing of the inquiry on the stratigraphical application of palæontological data.

## 2. 'The Structure and Relationships of the *Carbonicolæ*.'

By Miss M. Colley March, M.Sc.

The evidence for the relationship of the *Carbonicolæ* to the Unionidæ, based on shell-structure, muscle-scars, form, habitat, ligament, and hinge-teeth appears insufficient. The first five of these characteristics are shared with obviously unrelated groups. With regard to the last—the teeth—as seen in developed specimens and reconstructions from sections, they seem to be absent. The hinge-apparatus appears to consist of a cardinal plateau, grooved for the reception of an internal ligament. The hinge-plate and ligamental groove are absent in *Carbonicola antiqua*, very poorly represented in *C. turgida* and similar forms, and most highly developed in *C. aquilina*. Another fact which argues against the relationship of the Unionidæ to the *Carbonicolæ* is the absence of ornament in the latter group and its presence in the former. This holds good whether the ornament is considered to be due to the effect of the glochidial hooks in the young shells, or to be the remains of ornament: because in the former case it implies the absence of the glochidial stage, and in the latter it implies descent from an unornamented ancestry.

The position of the *Carbonicolæ* appears to be unsettled, and to be possibly quite different from that of any of the Pelecypoda yet studied: because, according to Bernard's work, the cardinal plateau is developed subsequently to the hinge-teeth, while in the *Carbonicolæ* it is acquired independently of them, specialization taking place in the ligament, for the reception of which the plateau is developed and specialized.



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XXIX. — *A Report on the Extra-Antarctic Amphipoda Hyperiidea collected by the 'Discovery.'* By DOROTHY A. STEWART, B.Sc., Platt Zoological Research Scholar, the University of Manchester.

[Plates IV.-VII.]

THE Amphipoda described below are, without exception, representatives of the pelagic group Hyperiidea, which were taken by the 'Discovery' Antarctic Expedition in tropical and subtropical waters during the year 1901 on the outward journey to the Pole.

The majority of the specimens appear to have been captured in surface tow-nets from localities in the tropical and South Atlantic; but there is, in addition, a single specimen of a subantarctic species, *Hyperiella antarctica*, from a more southerly latitude.

The determination of the species of Hyperiidea in a collection like the present one, consisting of isolated specimens from scattered localities, is attended with considerable difficulty—most of the species seem to be very imperfectly known, and the whole group is badly in need of revision. The material at hand is wholly inadequate to attempt such a revision, and in the course of the work it has often been necessary to identify specimens by locality rather than by character, so trifling have been the points used in specific distinctions.

It is interesting to record the occurrence of an entirely new genus, *Hemiscelus*, represented by a specimen taken in the  
*Ann. & Mag. N. Hist. Ser. 8. Vol. xii.* 18

S. tropical Atlantic, as well as two new species of *Vibilia*, which have been added to the list of those already known.

The presence of several other already-known species in the collection has also served to extend their geographical range considerably southward.

It may be as well, before proceeding to a description of the various types, to indicate clearly the terminology which has been adopted throughout. In all Amphipoda, the first thoracic appendages are modified to serve as additional mouth-organs, and the second and third are slightly differentiated from the succeeding ones, being more or less modified for prehension—for these latter the terms *first* and *second gnathopods* are used, the remaining five thoracic limbs being designated as the *third*, *fourth*, *fifth*, *sixth*, and *seventh legs* respectively.

The various joints or segments of the limbs are described in their numerical order as the *second* (or *basal*) joint, *third*, *fourth* (or *merus*), *fifth* (or *carpus*), *sixth* (or *propodus*), and *seventh* (or *dactylus*).

The classification adopted in the arrangement of the various families is that used by Stebbing in his report on the 'Challenger' Amphipoda, the only differences being that the genus *Dairella* is placed in a distinct family, as proposed by Vosseler, and the name of the family Tryphænidæ is changed to Lycæidæ, as suggested by Sars.

The collection is the property of the British Museum (Natural History).

The examination of the specimens has been carried out in the Zoological Laboratories of the University of Manchester, under the direction of Prof. S. J. Hickson, F.R.S., to whom I am indebted for many helpful suggestions.

I desire also to express my thanks to Dr. W. M. Tattersall for permitting me in the first place to examine the collection, for his continual guidance and encouragement during the preparation of this paper, and for his valuable assistance in the final revision and arrangement.

### Tribe HYPERIIDÆ.

#### Family Vibiliidæ.

#### Genus VIBILIA, Milne-Edwards.

#### *Vibilia propinqua*, Stebbing, 1888.

*Vibilia propinqua*, Vosseler, 1901.

*Vibilia propinqua*, Stebbing, 1904.

*Locality.* Lat. 13° 59' S., long. 34° 35' W., Sept. 9th, 1901 (near Bahia), two females.

Stebbing (1904) quotes as a feature to distinguish this species from *V. jeangerardi* the fact that the second and third ual segments are coalesced.

Chevreaux (1900) has pointed out that in *V. jeangerardi* the second and third ual segments are fused in the centre, but free at the edges—a fact which Stebbing (1904) corroborates and which is borne out by the specimens in the present collection.

In *V. propinqua*, however, exactly the same thing occurs, and from an examination of several species it would appear that this partial fusion of the last two ual segments is of frequent occurrence among different species of *Vibilia*. It can therefore hardly be regarded as of any value as a specific character.

*Distribution.* North Pacific (*Stebbing*); S. Atlantic, Guinea Stream, and Sargasso Sea (*Vosseler*); Bay of Biscay (*Stebbing*); West coast of Ireland (*Tattersall*).

*Vibilia viatrix*, Bovallius.

*Vibilia viatrix*, Bovallius, 1887 (1) & (2).

*Locality.* Lat.  $15^{\circ} 14\frac{1}{2}'$  S., long.  $33^{\circ} 11\frac{1}{2}'$  W., Sept. 10th, 1901 (near Bahia), male and female.

Bovallius (1887), when describing the species, remarks that "the second and third ual segments are free, not coalesced"; and Stebbing (1888), in describing a specimen closely resembling that of Bovallius, constitutes a separate species, *V. viator*, on the ground that it is distinct in having the second and third ual segments fused.

Among the forms in the present collection, however, which agree in all other essential points with that figured and described by Bovallius, we find the same peculiarity as in *V. propinqua* and *V. jeangerardi*, i. e. the second and third ual segments are fused at the centre, but free at the margins. It will thus be seen that this character is of fairly common occurrence.

*Distribution.* Very widespread. N. and S. Atlantic, tropical Pacific, and Indian Ocean (*Bovallius*). Recorded by Stebbing (1888) from "Cape York."

*Vibilia jeangerardi*, Lucas.

*Vibilia jeangerardi*, Lucas, 1845.

*Vibilia jeangerardi*, Marion, 1874.

*Vibilia jeangerardi*, Bovallius, 1887 (1) & (2).

*Locality.* Off Madeira, one female.

Chevreaux (1900) has drawn attention to the partial fusion

of the last two ural segments, which has already been dealt with in this paper.

In the structure of the seventh leg, to which he also drew attention, the 'Discovery' specimen agrees in having the last joint shorter than the penultimate one.

*Distribution.* The Atlantic, the Mediterranean (*Bovallius*); N. Atlantic Ocean (*Chevreaux*); Sargasso Sea and tropical Atlantic (*Vosseler*).

*Vibilia serrata*, sp. n. (Pl. IV.; Pl. V. figs. 1-6.)

*Localities.* Lat.  $54^{\circ} 3' S.$ , long.  $34^{\circ} 35' W.$ , Dec. 17th, 1903, surface (off St. Georgia), two males. Lat.  $36^{\circ} 27\frac{1}{2}' S.$ , long.  $8^{\circ} 20' W.$ , Sept. 24th, 1901, one male. Lat. obs.  $37^{\circ} 47' S.$ , long.  $3^{\circ} 59' E.$ , Sept. 28th, 1901 (near Tristan da Cunha), one male.

*Body* (Pl. IV.) fairly broad and stoutly built; pleon sharply distinct from the pereion.

*Head* rostrate, about twice as deep as long, and considerably longer than the first two pereional segments.

*Pereion* rounded, not carinate; equal in length to the pleon.

*Epimeral plates* of the pleon of considerable size and covering about half the peduncles of the pleopods; lower margins deeply serrated, the number of teeth being greater on the second and third than on the first plate.

*Eyes* extremely large, occupying the entire lateral portions of the head; deeply pigmented.

*First antennæ* (Pl. V. fig. 1) having the basal joint of the peduncle longer than the other two together; the first joint of the flagellum half as long again as the head, broad and oval at the base, and becoming thin and tapering at the apex; terminal joints two in number and very minute.

*Second antennæ* (Pl. V. fig. 2) seven-jointed, of which the fifth is the longest; the anterior border of all the joints bearing numerous small bristles.

*First gnathopods* (Pl. V. fig. 3) simple, slightly shorter than the second; basal joint of considerable breadth; merus with a prominent seta at the hinder edge of the lower border; carpus considerably broader than the propodus, but about the same length, the corners of the distal border feebly produced; curved inner border of the propodus finely serrated; dactylus stoutly built and half as long as the propodus, having the inner margin finely serrate.

*Second gnathopods* (Pl. V. fig. 4): basal joint long and somewhat linear; merus having the hinder border fringed



with one or two long setæ ; carpal process half as long as the propodus, serrated on its inner distal margin ; hinder margin of the propodus bearing numerous fine serrations ; curved edge of the dactylus finely serrated.

*Third and fourth legs* about equal in length ; merus as long as, but slightly broader than, the carpus, the anterior border slightly produced at its distal end ; propodus a little longer than the carpus, serrated on its hinder margin, which bears numerous small setæ ; dactylus slightly curved, about half as long as the propodus.

*Fifth and sixth legs* considerably longer than the third and fourth ; basal joint broad and ovate ; merus slightly shorter than the carpus ; propodus very long and linear, as long as the two preceding joints ; the anterior border of the merus, carpus, and propodus bearing numerous small setæ ; dactylus feebly curved, about  $\frac{1}{5}$  of the length of the propodus.

*Seventh leg* (Pl. V. fig. 5) : basal joint almost as long and quite as broad as those of the preceding limbs ; the anterior border with four strong setæ ; remaining joints remarkably reduced in size, forming an almost inconspicuous appendage ; the entire limb reaching to about  $\frac{1}{3}$  of the length of the fifth and sixth legs.

*Pleon* equal in length to, but slightly deeper than, the pereon ; *pleopods* with the peduncles a little shorter than the rami.

*The urus* : second and third ural segments free, not coalesced ; hinder corners of the last ural segment slightly produced backwards.

*First pair of uropoda* : peduncles about equal in length to the rami ; both rami with serrated margins.

*Second pair of uropoda* not reaching to the apex of the third pair ; peduncles considerably shorter than the rami ; outer ramus slightly shorter and narrower than the inner ; both rami with serrated margins.

*Third pair of uropoda* : peduncles longer than the rami ; both rami with fine serrations on the inner and outer margins.

*Telson* (Pl. V. fig. 6) semicircular, about  $\frac{1}{4}$  as long as the peduncles of the last uropods.

*Length*, excluding antennæ, 8 mm.

*Vibilia serrata* may be easily recognized by the serrations on the epimeral plates and by the curious structure of the seventh leg, which is quite unlike that found in any other species of this genus, with the exception of *V. hodysoni*, which will be described later.

The large size of the eyes is a distinguishing feature, although it is possible that this may be a sexual character, as

the specimens at my disposal are all males; however that may be, the two features mentioned above will serve to distinguish this species from any hitherto described.

The first antenna is very distinctive in appearance, having the basal joint of the flagellum broad and oval, but tapering towards the apex, and the curious form of the second antenna is also worthy of note, the fourth and fifth joints being strikingly longer than the others; this, again, is probably a character peculiar to the male.

In the possession of a small rostrum and in the size of the eyes this species resembles *V. macropis*, Bovallius, but the first and second antennæ in the two forms are entirely different, and may easily serve to distinguish them.

The shape of the last ural segment, which has the hinder corners produced backwards, suggests *V. gracilentia*, and here again the exceptional size of the eyes only serves to increase the resemblance.

### *Vibilia longipes*, Bovallius.

*Vibilia longipes*, Bovallius, 1887 (1) & (2).

*Localities.* Lat. D.R.  $10^{\circ} 32'$  S., long.  $32^{\circ} 29'$  W., Sept. 7th, 1901, one male. Lat.  $12^{\circ} 27'$  S., long.  $33^{\circ} 33'$  W., Sept. 8th, 1901 (S. Atlantic, near Pernambuco), one male.

*Distribution.* The S. Atlantic, the Pacific (*Bovallius*); South Equatorial current (*Vosseler*).

### *Vibilia armata*, Bovallius.

*Vibilia armata*, Bovallius, 1887 (1) & (2).

*Localities.* Lat.  $36^{\circ} 03\frac{1}{4}'$  S., long.  $12^{\circ} 50\frac{1}{4}'$  E., Oct. 1st, 1901, two males. Lat.  $35^{\circ} 14\frac{1}{4}'$  S., long.  $15^{\circ} 11\frac{3}{4}'$  E., Oct. 2nd, 1901 (near Tristan da Cunha), one male.

*Distribution.* Tropical and S. Atlantic (*Bovallius*); the Mediterranean (*Vosseler*); Bay of Biscay (*Stebbing*); West coast of Ireland (*Tattersall*).

### *Vibilia gracilentia*, Bovallius.

*Vibilia gracilentia*, Bovallius, 1887 (1) & (2).

*Locality.* Lat.  $35^{\circ} 14\frac{1}{4}'$  S., long.  $15^{\circ} 11\frac{3}{4}'$  E., Oct. 2nd, 1901 (off the Cape of Good Hope), one male.

In this specimen the produced hinder corners of the last ural segment are not so long as those in the form figured and described by Bovallius, 1887 (2); but in all other respects the 'Discovery' form is in close agreement with his description.

The above locality would appear to be the most southerly yet recorded for the species. Vosseler (1901) reports it from the S. Atlantic, but remarks that its occurrence there requires further confirmation.

*Distribution.* The Atlantic (*Bovallius*); Gulf of Florida, N. and S. Equatorial currents (*Vosseler*).

*Vibilia hodgsoni*, sp. n. (Pl. VI. figs. 1-6.)

*Locality.* Lat.  $36^{\circ} 03\frac{1}{4}'$  S., long.  $12^{\circ} 50\frac{1}{4}'$  E., Oct. 1st, 1901 (near the Cape of Good Hope), one male.

*Body* comparatively small, but compact.

*Head* (Pl. VI. fig. 1) fairly short, rostrate, having the front recurved over the origin of the antennæ.

*Coxal plates* rectangular, of uniform depth, those of the third and fourth legs considerably shorter than the others; hinder corners of the fifth and sixth plates produced to a point.

*Epimeral plates* of the pleon with the hinder margins feebly serrated.

*Eyes* rather small, occupying the centre of the lateral part of the head; corneal facets large and rounded.

*First antennæ* (Pl. VI. fig. 1): first joint of the peduncle stouter than the two following and longer than either; first (and only) joint of the flagellum slightly longer than the head, broad, almost oval in shape, with a blunt apex, and having one or two small setæ on the inferior border.

*Second antennæ* (Pl. VI. fig. 1) five-jointed, having the third and fourth joints the longest; numerous short setæ on the anterior border of all the joints.

*First gnathopods* (Pl. VI. fig. 2) simple, slightly shorter than the second; basal joint broad, but linear; posterior border of the merus and carpus bearing numerous small setæ; hinder border of the propodus serrated; dactylus stout and slightly curved.

*Second gnathopods* (Pl. VI. fig. 3) with basal joint fairly narrow and longer than that of the preceding leg; merus almost as long as the carpus, narrower at the distal than the proximal end, and with eight strong setæ on the posterior border; carpus slightly broader than the merus; carpal process half as long as the propodus, serrated on its inner margin and terminating in a small stout spine; propodus almost as long as the carpus, the inner border serrated; dactylus stout and strongly curved.

*Third and fourth legs* almost equal in length, having the basal joint linear; merus long and narrow, broadest at the

distal end, the anterior edge with one or two small setæ; carpus about equal in length to the basal joint, but slightly narrower; propodus curved, slightly longer than the carpus, having numerous short setæ on its hinder border; dactylus stout, almost straight, about  $\frac{1}{4}$  as long as the propodus.

*Fifth and sixth legs* considerably longer than the third and fourth; basal joint broad and laminate, with three setæ on the lower part of the anterior border; merus long and narrow, resembling the carpus in shape; propodus stout, rather shorter than the carpus, finely serrated on the lower half of the anterior border; dactylus short and stout.

*Seventh leg* (Pl. VI. fig. 4) very distinctive in appearance; basal joint extremely large in proportion to the remaining ones, having the lower hinder corner considerably produced and reaching to about half the length of the merus; lower part of the anterior border bearing six prominent setæ. Remaining joints comparatively uniform in structure; merus with a large seta on the anterior and posterior borders; carpus and propodus with their anterior margins serrated; dactylus stout, equal in length to the propodus.

*Pleon* not sharply marked off from the pereion. Peduncles of the *pleopods* shorter than the rami.

*The urus* (Pl. VI. fig. 6) having the second and third segments coalesced at the centre, but free at the margins; second segment only half as broad as the first and third; hinder corners of the last segment slightly produced backwards.

*First pair of uropods* with the peduncles linear, about twice as long as the rami; both rami equal in length, with broad serrations on the margins, more numerous on the outer than on the inner margin.

*Second pair of uropods* considerably shorter than the first; peduncles not quite as long as the rami; outer ramus slightly shorter than the inner, and both having serrated margins, with the serrations finer and more numerous on the inner margin.

*Third pair of uropods* having the peduncles broad and fairly stout, about the length of the rami; inner rami stout, rounded at the distal ends, with their inner margins finely serrated; outer rami narrower, broad at the base but tapering to a point, and having numerous serrations on the inner margin and a few small setæ on the outer one.

*Telson* (Pl. VI. fig. 6) broad and tongue-shaped, about half as long as the peduncles of the last uropods.

*Length*, excluding antennæ, 6 mm.



The nearest allies of this species would seem to be *V. jean-gerardi* and *V. longipes*.

It resembles the former in the possession of a rostrate head and in the fusion of the second and third ural segments, while the length of the fifth and sixth walking-legs in relation to the preceding ones recalls *V. longipes*.

From both these forms *V. hodgsoni* is quite distinct, in that (1) the hinder corners of the last ural segment are distinctly produced backward, and (2) the seventh walking-leg is of aberrant and quite characteristic shape.

It is curious to notice that in two points (viz. the curious structure of the seventh leg and the serrated epimeral plates) this species presents some resemblance to *V. serrata*; but it is easily distinguished by (1) the form of the first antenna, (2) the feeble serrations on the margins of the epimeral plates, and (3) the form of the seventh leg, which has the hinder portion of the inferior margin considerably produced downwards.

It is to be regretted that in the present collection there is no female of this species or of *V. serrata*.

#### Family Paraphronimidæ, Bovallius.

##### Genus PARAPHRONIMA, Claus.

##### *Paraphronima gracilis*, Claus.

*Paraphronima gracilis*, Claus, 1879.

*Locality.* Lat.  $17^{\circ} 15'$  S., long.  $32^{\circ} 05'$  W., Nov. 9th, 1901 (S. Atlantic, between Bahia and Rio de Janeiro), one male, length 8.5 mm.

*Distribution.* Tropical and temperate regions of the Atlantic; the northern temperate and the tropical regions of the Pacific (*Bovallius*, *Stebbing*); the Azores (*Chevreaux*).

##### *Paraphronima crassipes*, Claus.

*Paraphronima crassipes*, Claus, 1879.

*Paraphronima clypeata*, Bovallius, 1885 & 1889.

*Paraphronima pectinata*, Bovallius, 1887.

*Localities.* Lat. obs.  $37^{\circ} 47'$  S., long.  $3^{\circ} 59'$  E., Sept. 28th, 1901, one female, length 11 mm. Lat. obs.  $37^{\circ} 33\frac{3}{4}'$  S., long.  $6^{\circ} 09'$  E., Sept. 29th, 1901 (between Tristan da Cunha and the Cape of Good Hope), twelve specimens, average length 12 mm.

In addition to the other sexual differences which have been

described as occurring in the genus, it is worthy of note that the males have somewhat longer mandibular palps than the females.

*Distribution.* Tropical Atlantic (*Bovallius*); the Mediterranean (*Claus*).

### Family Dairellidæ.

Genus DAIRELLA, Bovallius.

*Dairella latissima*, Bovallius.

*Dairella latissima*, Bovallius, 1887 (1) & 1889.

*Dairella bovalli*, Stebbing, 1888.

*Dairella latissima*, Vosseler, 1901.

*Locality.* Lat.  $37^{\circ} 33\frac{3}{4}'$  S., long.  $6^{\circ} 09'$  E., Sept. 29th, 1901 (between Tristan da Cunha and the Cape of Good Hope), one female, length 9.0 mm.

*Distribution.* Temperate and tropical Atlantic (*Bovallius*); S. Equatorial current and the Mediterranean (*Vosseler*); West coast of Ireland (*Tattersall*); the Mediterranean (*Chevreur*).

### Family Phronimidæ.

Genus PHRONIMA, Latreille.

*Phronima sedentaria*, Forskål.

*Phronima sedentaria*, Forsk. 1775.

*Phronima sedentaria*, Vosseler, 1901.

*Locality.* Off Madeira, Aug. 14th, 1901, a full-grown male, 11 mm., a young female, 8 mm., and three immature specimens.

*Distribution.* Widespread in the tropical and temperate seas, and recorded from around the British coasts by Bate and Westwood, Walker, and Tattersall.

*Phronima stebbingi*, Vosseler.

*Phronima stebbingi*, Vosseler, 1901.

*Phronima pacifica*, Stebbing, 1888.

*Phronima pacifica*, Bovallius, 1889.

*Localities.* Lat.  $28^{\circ} 25'$  S., long.  $23^{\circ} 56'$  W., Sept. 17th, 1901, male and female, 8 mm. Lat.  $30^{\circ} 43'$  S., long.  $21^{\circ} 36'$  W., Sept. 18th, 1901 (N. of Tristan da Cunha), one female, 7 mm. Lat.  $37^{\circ} 33\frac{3}{4}'$  S., long.  $6^{\circ} 09'$  E., Sept. 29th, 1901 (between Tristan da Cunha and the Cape of Good Hope), two females, 7 mm.

*Distribution.* Tropical and subtropical Atlantic and Pacific (*Bovallius*); Florida Stream, Sargasso Sea, Guinea Stream, and the N. and S. Equatorial currents (*Vosseler*); off Sierra Leone (*Stebbing*); the Mediterranean (*Chevreux*).

Family **HYPERIIDÆ**.

Genus **HYPERIA**, Latreille.

*Hyperia galba* (Montagu).

*Locality.* Off Madeira, one female, 18 mm.

*Distribution.* Arctic region of Atlantic and the Bank of Newfoundland (*Bovallius* and *Vosseler*); N. and S. temperate Atlantic, the tropical Atlantic, the Baltic Sea, and the Mediterranean (*Bovallius*).

In addition, it has a widespread distribution around the British and Irish coasts.

*Hyperia vosseleri*, Stebbing.

*Lestrigonus fabrei*, Milne-Edwards.

*Hyperia fabrei*, Bovallius, 1889.

*Hyperia vosseleri*, Stebbing, 1904.

*Locality.* Lat.  $15^{\circ} 45\frac{1}{2}'$  S., long.  $33^{\circ} 11\frac{1}{2}'$  W., Sept. 10th, 1901 (near Bahia), male and female, 3 mm.

*Distribution.* Tropical Atlantic, Caribbean Sea, and the Indian Ocean (*Bovallius*); the coast of Algeria (*Chevreux*); Florida Stream, Sargasso Sea, Guinea Stream, and W. and S. Equatorial currents (*Vosseler*).

*Hyperia luzoni*, Stebbing.

*Hyperia luzoni*, Stebbing, 1888.

*Localities.* Lat.  $13^{\circ} 59'$  S., long.  $34^{\circ} 35'$  W., Sept. 9th, 1901 (near Bahia), one male, 3 mm. Lat. obs.  $28^{\circ} 25'$  S., long.  $23^{\circ} 56'$  W., Sept. 17th, 1901 (N. of Tristan da Cunha), one male, 4 mm. Lat.  $56^{\circ} 30'$  S., long.  $169^{\circ} 30'$  E., Dec. 19th (S. of New Zealand), one male, 4 mm.

The last locality is the most southerly yet recorded for the species.

*Distribution.* China Sea, the Philippines (*Stebbing*, 1888); Sargasso Sea, N. and S. Equatorial currents (*Vosseler*); Bay of Biscay (*Stebbing*, 1904).

*Hyperia schizogeneios*, Stebbing.

*Hyperia schizogeneios*, Stebbing, 1888.

*Hyperia schizogeneios*, Bovallius, 1889.

*Locality.* Lat. obs.  $13^{\circ} 59'$  S., long.  $34^{\circ} 35'$  W., Sept. 9th, 1901 (near Bahia), one female, 2.5 mm.

*Distribution.* Tropical Atlantic (*Bovallius*); the temperate Atlantic and the Mediterranean (*Chevreaux*); the Equatorial currents, the Gulf of Guinea, and the Gulf Stream (*Vosseler*).

### Genus HYPERIELLA, Bovallius.

#### *Hyperiella antarctica*, Bovallius.

*Hyperiella antarctica*, Bovallius, 1887 (1) & 1889.

*Hyperiella antarctica*, Stebbing, 1888.

*Locality.* Lat.  $56^{\circ} 30'$  S., long.  $169^{\circ} 30'$  E., Dec. 19th, 1903, one male, 8 mm., at surface in dredge. Temp. of air  $40^{\circ}$ , sea  $107^{\circ}$  Fahr.

This form agrees in general appearance and in structural details with the description of *H. antarctica* given by Bovallius (1889), and the form of the uropods particularly is in close agreement with his figure. It is curious, however, to notice the presence of distinct spines on the three segments of the metasome, a character quoted by Stebbing (1888) as being representative of *H. dilatata*.

It may also be remarked that Walker (1907) has recorded the capture of *H. dilatata* from the winter-quarters of the 'Discovery' Expedition.

*Distribution.* The American Antarctic region, lat.  $58^{\circ} 40'$  S., long.  $76^{\circ}$  W. (*Bovallius*).

### Genus HYPERIOIDES, Chevreux.

#### *Hyperioides longipes*, Chevreux.

*Hyperioides longipes*, Chevreux, 1900.

*Locality.* Lat.  $37^{\circ} 33\frac{3}{4}'$  S., long.  $6^{\circ} 09'$  E., Sept. 29th, 1901 (near Tristan da Cunha), eight examples, 5-7 mm.

This record of the occurrence of the species indicates a considerable southerly extension of its geographical range.

*Distribution.* Temperate and tropical Atlantic (*Chevreaux* and *Vosseler*); the Mediterranean (*Vosseler* and *Chevreaux*); Bay of Biscay (*Stebbing*); W. coast of Ireland (*Walker* and *Tattersall*).

### Genus EUTHEMISTO, Bovallius.

#### *Euthemisto bispinosa*, Boeck.

*Locality.* Lat.  $35^{\circ} 10'$  S., long.  $13^{\circ} 40'$  W., Sept. 22nd, 1901 (near Tristan da Cunha), one female, 13 mm.



*Distribution.* General throughout the N. Atlantic and Arctic Oceans and the North Sea.

Its occurrence, therefore, in these latitudes is interesting as being the most southerly yet recorded.

*Euthemisto compressa*, Goës.

*Localities.* Lat.  $35^{\circ} 10'$  S., long.  $13^{\circ} 40'$  W., Sept. 22nd, 1901, eleven specimens, average length 14 mm. Lat. D.R.  $36^{\circ} 27\frac{1}{2}'$  S., long.  $8^{\circ} 20'$  W., Sept. 24th, 1901 (near Tristan da Cunha), numerous small specimens, average length 6.5 mm.

*Distribution.* General in the N. Atlantic and Arctic Oceans and the North Sea.

Several small specimens of an *Euthemisto* were taken at the following locality:—

Lat.  $62^{\circ} 8'$  S., long.  $170^{\circ} 45'$  E., Dec. 22nd, 1903, at the surface.

These are in such bad condition that it is impossible to identify them with any certainty; but in all probability they belong to *E. gaudichaudii*, Guérin, which has been recorded by Walker (1907) from lat.  $54^{\circ} 01'$  S., long.  $170^{\circ} 49'$  E., to lat.  $63^{\circ} 04'$  S., long.  $175^{\circ} 43'$  E.

Genus PARATHEMISTO, Boeck.

*Parathemisto oblivia*, Kröyer.

*Locality.* Lat.  $15^{\circ} 45\frac{1}{2}'$  S., long.  $33^{\circ} 11\frac{1}{2}'$  W., Sept. 9th, 1901, one female, 3.5 mm.

The specimen is considerably damaged, and is consequently difficult to identify with any certainty.

*Distribution.* Arctic region, Greenland, W. coast of Norway, and N. temperate region; coast of Great Britain (*Borallius*); Gulf Stream (*Vosseler*); Bay of Biscay (*Stebbing*); coast of France and Spain (*Chevreux*).

Family PHROSINIDÆ, Stebbing.

Genus PHROSINA, Risso.

*Phrosina semilunata*, Risso.

*Localities.* Off Madeira, an adult female and two young specimens. Lat.  $35^{\circ} 14\frac{1}{4}'$  S., long.  $15^{\circ} 11\frac{3}{4}'$  E., Oct. 10th, 1901 (near the Cape of Good Hope), two females.

*Distribution.* Atlantic, Mediterranean, Indian Ocean, and

Pacific (*Bovallius*); Gulf of Florida, Sargasso Sea, N. Equatorial current, Gulf of Guinea, and the Gulf Stream (*Vosseler*); Atlantic Ocean, around the Azores (*Chevreux*).

### Genus PRIMNO, Guérin.

#### *Primno macropa*, Guérin.

*Euprimno macropus*, Bovallius, 1887 (1).

*Primno macropa*, Stebbing, 1904.

*Locality.* Lat. D.R.  $36^{\circ} 27\frac{1}{2}'$  S., long.  $8^{\circ} 20'$  W., Sept. 24th, 1901 (near Tristan da Cunha), one female, 6 mm.

*Distribution.* Tropical and subtropical regions of the Atlantic and Pacific, the Indian Ocean, the Australian Antarctic region (*Bovallius*); S. Pacific (*Stebbing*, 1888); the North Atlantic (*Chevreux* and *Vosseler*); Bay of Biscay (*Stebbing*, 1904).

### Genus ANCHYLOMERA, Milne-Edwards.

#### *Anchylomera blossevillei*, Milne-Edwards.

*Locality.* Lat.  $19^{\circ} 13'$  S., long.  $39^{\circ} 35'$  W., Sept. 12th, 1901 (near Bahia), female, 7.5 mm.

*Distribution.* The Atlantic, Mediterranean, Indian Ocean, the Pacific, and the Antarctic region (*Bovallius*); N. Atlantic (*Vosseler* and *Chevreux*).

### Family Typhidæ, Dana.

### Genus PLATYSCELUS, Spence Bate.

#### *Platyscelus armatus*, Claus.

*Eutyphis armatus*, Claus, 1879.

*Eutyphis armatus*, Bovallius, 1887 (1).

*Locality.* Lat.  $15^{\circ} 45\frac{1}{2}'$  S., long.  $33^{\circ} 11\frac{1}{2}'$  W., Sept. 9th, 1901 (near Bahia), male and female, 2 mm.

*Distribution.* Atlantic and Indian Oceans, coast of Chili and Zanzibar (*Claus*); N. Pacific and N. Atlantic (*Stebbing*).

In addition the collection contains one specimen with the label missing, which I judge to be *P. armatus*, var. *inermis*. This form lacks the characteristic projection of the fifth epimeral plate, and the structure of the gnathopods differs slightly from the description of Claus, the metacarpus of the second pair being acutely narrowed at the apex, not rounded as in Claus's figure (1887).

Genus *HEMITYPHIS*, Claus.

*Hemityphis tenuimanus*, Claus.

*Hemityphis tenuimanus*, Claus, 1879.

*Dithyrus tenuimanus*, Bovallius, 1887 (1).

*Hemityphis tenuimanus*, Claus, 1887.

*Hemityphis tenuimanus*, Stebbing, 1888.

*Localities.* Lat.  $35^{\circ} 10'$  S., long.  $13^{\circ} 40'$  W., Sept. 22nd, 1901 (near Tristan da Cunha), one male, 5 mm. Lat.  $15^{\circ} 45\frac{1}{2}'$  S., long.  $33^{\circ} 11\frac{1}{2}'$  W., Sept. 10th, 1901 (near Bahia), one, immature.

*Distribution.* Atlantic Ocean and the Cape of Good Hope (Claus); the Pacific Ocean and the N. Atlantic (Stebbing); off the Azores (Chevreux).

Genus *PARATYPHIS*, Claus.

*Paratyphis parvus*, Claus.

*Paratyphis parvus*, Claus, 1887.

*Locality.* Lat. obs.  $13^{\circ} 59'$  S., long.  $34^{\circ} 35'$  W., Sept. 9th, 1901; one female, 3 mm.

*Distribution.* Lagos, the Atlantic Ocean (Claus); off the Azores (Chevreux).

The above is therefore the most southerly record yet obtained for this species.

Family *Scelidæ*, Claus.

Genus *HEMISCELUS*, nov.

First and second gnathopods with the carpal joint produced so that *both* limbs are subcheliform.

Laminal basal joint of the sixth leg without a sickle-shaped slit.

Seventh leg elongate and completely developed.

As I had only a single specimen at my disposal, the mouth-organs were not dissected out.

In many respects this form closely approaches *Schizoscelus ornatus*, Claus; but the possession of a subcheliform first gnathopod serves to distinguish it. Another point of difference is the absence of the pocket-like slit on the first joint of the sixth leg, which is so characteristic a feature of *Schizoscelus*.

A cursory examination of the gnathopods might induce one to regard the present specimen as a member of the

Typhidæ, but the structure of the seventh leg is totally unlike that of any representative of this family with which it might otherwise be confused. The general shape of the body, the structure of the appendages, and formation of the uropods and telson seem to indicate that it occupies a position intermediate between the genera *Euscelus* and *Schizoscelus*, approaching the former in the shape of the gnathopods and the latter in the general form of the urosome and telson.

*Hemiscelus diplochelatus*, gen. et sp. n.  
(Pl. VII. figs. 1-9.)

*Locality.* Lat. obs.  $15^{\circ} 45\frac{1}{2}'$  S., long.  $33^{\circ} 11\frac{1}{2}'$  W., Sept. 10th, 1901 (near Bahia), one female, 2 mm.

*Body* broad and stoutly built, pereion slightly arched.

*Head* short, flattened in front, slightly deeper than the anterior thoracic segments.

*Eyes* large, not reaching to the dorsal surface of the head.

*Coxal plates* sharply distinct from the thoracic segments, rectangular in shape, with the hinder corners sharply produced backwards.

*First gnathopods* (Pl. VII. fig. 1) with the basal joint about as long as the rest of the limb together and having one small seta on the anterior border; merus not produced; carpus broad, with five small setæ on the hinder margin; carpal projection minutely serrated, about half as long as the propodus; dactylus stout, slightly curved, about one-third of the length of the propodus.

*Second gnathopods* (Pl. VII. fig. 2) with the branchial vesicle oval, slightly broader than the basal joint, but not quite as long; basal joint narrow and almost rectangular, considerably longer than that of the preceding pair; merus somewhat broader than the third joint, having the two anterior corners slightly produced, and a long subapical seta on the hind margin; carpal projection serrated, almost as long as the propodus; dactylus slender, tapering to a fine point, and strongly curved.

*Third and fourth pairs of legs* (Pl. VII. figs. 3 & 4) with the branchial vesicles slightly longer than the linear basal joint; merus somewhat widened in the distal portion; carpus shorter than the merus, lower front corner not produced; propodus slightly curved, narrower than the carpus; dactylus stout and strongly curved.

*Fifth pair of legs* (Pl. VII. fig. 5) having the basal joint longer than in the third and fourth, and broadly ovate, with



the front margin descending below the hind margin; third joint very short; merus slightly longer than the carpus and widest in its middle portion; propodus abruptly narrowed and slightly curved; dactylus slender and tapering, equal in length to the propodus.

*Sixth pair of legs* (Pl. VII. fig. 6) with the last three joints missing in the present specimen; basal joint broad and laminar, considerably longer than that of the preceding pair, and slightly wider in the upper than in the lower portion; posterior margin more convex than the anterior; merus about equal in length to the third joint, widening somewhat towards its lower border.

*Seventh pair of legs* (Pl. VII. fig. 7) about equal in length when in a folded position to the basal joint of the sixth pair, and very slenderly built; basal joint not quite so long as the remaining ones and narrowing somewhat towards the distal end; merus considerably longer than the two following joints together and slightly broader than either; carpus and propodus almost equal in size, the latter having a small hooked finger at its apex (Pl. VII. fig. 8).

*Pleopods* with the peduncles shorter than the rami.

*Uropods* having all the rami comparatively smooth, with the exception of a few minute pectinations around the apices.

Peduncles of the first pair equal in length to the rami; rami lanceolate, reaching below the telson.

Peduncles of the second pair longer than the rami; inner ramus almost twice as long and slightly broader than the outer.

Peduncles of the third pair slightly shorter than the inner ramus; inner ramus twice as long and fully twice as broad as the outer.

*Telson* (Pl. VII. fig. 9) broadly triangular, with rounded apex and minutely pectinated margin.

### Genus SCHIZOSCELUS, Claus.

#### *Schizoscelus ornatus*, Claus.

*Schizoscelus ornatus*, Claus, 1879.

*Locality.* Lat.  $13^{\circ} 59'$  S., long.  $34^{\circ} 35'$  W., Sept. 9th, 1901, one female.

*Distribution.* The Atlantic Ocean (Claus); the Philippine Islands (Stebbing); between the Azores and Newfoundland (Cherreau).

## Family Pronoidæ.

Genus EUPRONOË, Claus.

*Eupronoë armata*, Claus.*Eupronoë armata*, Claus, 1879.

*Localities.* Lat. D.R.  $10^{\circ} 32' S.$ , long.  $32^{\circ} 29' W.$ , Sept. 7th, 1901, one male, 8 mm., and two females (immature). Lat.  $13^{\circ} 59' S.$ , long.  $34^{\circ} 35' W.$ , Sept. 9th, 1901, two females, 3 mm.

The specimens from the latter locality resemble *E. armata* in the general shape of the body and appendages, but differ in the form of the seventh leg, which has the terminal joint elongate.

It is possible that they may be forms of *E. intermedia*, Stebbing, but I prefer to regard them as immature *E. armata*.

*Distribution.* Atlantic Ocean, Zanzibar (*Claus*); the Azores (*Chevreaux*). Walker has recently reported its capture in the Indian Ocean.

## Family Lycæidæ.

Genus BRACHYSCELUS, Spence Bate.

*Brachyscelus crusculum*, Spence Bate.*Thamyris mediterranea*, Claus, 1879.

*Locality.* Lat.  $28^{\circ} 25' S.$ , long.  $23^{\circ} 56' W.$ , Sept. 17th, 1901 (N. of Tristan da Cunha), one male, 6.5 mm.

*Distribution.* Mediterranean (*Claus*, *Chevreaux*, and *Vosseler*); the Atlantic (*Stebbing* and *Chevreaux*); N. Pacific (*Stebbing*); West coast of Ireland (*Walker* and *Tattersall*).

The present locality, therefore, would appear to be the most southerly yet recorded for the species.

Genus LYCÆA, Dana.

*Lycæa vincentii*, Stebbing.*Lycæa vincentii*, Stebbing, 1888.

*Localities.* Off Madeira, one male, length 8 mm. Lat.  $13^{\circ} 59' S.$ , long.  $34^{\circ} 35' W.$ , Sept. 9th, 1901, young female, 2.5 mm.

This specimen agrees very well with Stebbing's figures of *L. vincentii*, especially as regards the structure of the seventh leg.

The characters separating *L. vincentii*, Stebbing, from

*L. robusta*, Claus, and *L. pulex*, Marion, to judge from published descriptions and figures, do not seem very convincing, and I have been led to refer my specimen to *L. vincentii* mainly because the locality of capture agrees with that of the type, rather than because I am convinced of its separate specific identity from *L. robusta* and *L. pulex*.

*Distribution.* Off St. Vincent and the Cape Verde Islands (*Stebbing*).

*Lycæa* sp.

*Locality.* Lat.  $15^{\circ} 45\frac{1}{2}'$  S., long.  $33^{\circ} 11\frac{1}{2}'$  W., Sept. 10th, 1901, one female.

In this specimen the entire urus is missing, so that it is impossible to identify it with any certainty. In all probability it is *L. vincentii*.

Family *Oxycephalidæ*, Spence Bate.

Genus *STREETSIA*, Stebbing.

*Streetsia washingtoni*, Senna?

*Locality.* Lat.  $19^{\circ} 13'$  S., long.  $39^{\circ} 35'$  W., Sept. 12th, 1901 (S. Atlantic, between Bahia and Rio de Janeiro), one male, 19 mm.

In many respects this form approaches closely to *S. stebbingi*, Chevreux (1900), but it differs in several important points, chief amongst which are: (1) the presence of serrations on the under margin of the head; (2) the inferior margin of the propodus of the first gnathopod is minutely serrated, whereas in *S. stebbingi* it bears four large teeth; (3) the carpus of the first gnathopod has four large teeth on the palmar margin, instead of only one, and the teeth on the propodus are more pronounced; (4) the inner distal corner of the peduncle of the second uropod is produced into a tooth instead of being rounded.

In general appearance and in the structure of the appendages the specimen is in close agreement with *S. washingtoni*, Senna (1902), but here, again, minor differences occur: (1) the serrations on the rostrum cover a considerably larger area than is represented in Senna's figure, extending at least to the commencement of the eye; (2) the first gnathopod has several minute serrations on the inferior margin of the propodus; (3) the teeth on the propodus of the second gnathopod are more pronounced than those of Senna's specimen.

The rami of the uropods are unfortunately missing, and

they are a feature which might have materially assisted in the identification.

The only other known species possessing a serrated rostrum is *S. challengerii*, Stebbing (1888), but the form of the urosome in the 'Discovery' specimen is totally different from that of the former, the last urol segment being approximately equal in length to the telson, whereas that of *S. challengerii* is only half as long as the telson.

On the whole, the specimen is far more in agreement with *S. washingtoni* than with either of the other forms, and I am inclined to regard it as representing that species.

*Distribution.* The Mediterranean (*Senna*).

### Genus DORYCEPHALUS, Bovallius.

#### *Dorycephalus lindströmi*, Bovallius.

*Leptocotis lindstroemi*, Bovallius, 1887 (1).

*Dorycephalus lindstroemi*, Bovallius, 1890.

*Locality.* Lat. 19° 13' S., long. 39° 35' W., Sept. 12th, 1901, one male, 10.5 mm.

*Distribution.* Subtropical region of the Atlantic (*Bovallius*); the North Atlantic (*Chevreaux*).

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## EXPLANATION OF THE PLATES.

### PLATE IV.

*Vibilia serrata*, sp. n., male, lateral view.  $\times 20$ .

### PLATE V.

*Vibilia serrata*, sp. n.

- Fig. 1.* Male, first antenna.  $\times 64$ .  
*Fig. 2.* " second antenna.  $\times 64$ .  
*Fig. 3.* " first gnathopod.  $\times 64$ .  
*Fig. 4.* " second gnathopod.  $\times 64$ .  
*Fig. 5.* " seventh leg.  $\times 64$ .  
*Fig. 6.* " telson and uropods.  $\times 60$ .

### PLATE VI.

*Vibilia hodgsoni*, sp. n.

- Fig. 1.* Head and first segments of male, lateral view.  $\times 64$ .  
*Fig. 2.* Male, first gnathopod.  $\times 64$ .  
*Fig. 3.* " second gnathopod.  $\times 64$ .  
*Fig. 4.* " seventh leg.  $\times 64$ .  
*Fig. 5.* " terminal joints of the seventh leg.  $\times 300$ .  
*Fig. 6.* " urosome, telson, and uropods.  $\times 64$ .

### PLATE VII.

*Hemiscelus diplochelatus*, gen. et sp. n.

- Fig. 1.* Female, first gnathopod.  $\times 64$ .  
*Fig. 2.* " second gnathopod.  $\times 64$ .  
*Fig. 3.* " third leg.  $\times 64$ .  
*Fig. 4.* " fourth leg.  $\times 64$ .  
*Fig. 5.* " fifth leg.  $\times 64$ .  
*Fig. 6.* " sixth leg.  $\times 64$ .  
*Fig. 7.* " seventh leg.  $\times 64$ .  
*Fig. 8.* " terminal joints of the seventh leg.  $\times 300$ .  
*Fig. 9.* " telson and uropods.  $\times 64$ .

XXX.—*Note on the Crop in the Mallophaga and on the Arrangement and Systematic Value of the Crop-Teeth.* By  
BRUCE F. CUMMINGS.

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DURING an examination for description\* of the interesting parasite *Trimenopon echinoderma*, Cummings, a row of strongly developed teeth was observed in specimens passed through caustic potash and mounted in Canada balsam, occupying a position in the abdomen at about the level where the proventriculus might be deemed to lie. Reference to Snodgrass's paper† on the anatomy of the Mallophaga showed that no proventriculus has been found to exist in this order. On dissection it became quite clear that in fact no portion of the base of the crop (or ingluvies) is constricted off as a gizzard either in the Ischnocera or in the other suborder, the Amblycera. Yet the base of the crop of the Amblycera in the genera *Heterodoxus*, *Trimenopon*, *Læmobothrium*, *Colpocephalum*, *Menopon*, *Trinoton*, *Boopis*, *Nitzschia*, and *Gyropus*, and probably in the remaining genera, possesses a circular row of beautiful proventricular teeth, so that, *functionally*, a proventriculus may be said to be present in this suborder. There are scattered teeth in the crop of the Ischnocera, but they occupy a different area of the crop, which in the Ischnocera is highly specialized.

The crop presents three types of structure in the Mallophaga. One form—the Amblyceran—is simple in being just an expansion of the lower part of the œsophagus. The second, represented by the majority of the Ischnocera, Snodgrass describes as complicated by a lateral and backward prolongation, so as to form a large expanded diverticulum of the œsophagus. The third type, present in the Ischnoceran family Trichodectidæ, has the remarkable form of a large sac connected with the lower end of the œsophagus by a long narrow neck.

Morphologically the crop is simply an expanded portion of the œsophagus. It is large in locusts and most other Orthoptera and in most adult Coleoptera. It may or may not be followed by the proventriculus, which is present and well developed in many carnivorous Coleoptera, in fleas, ants, and *Cynips*. In fact, the alimentary canal is a notoriously unsafe guide in phylogeny, although the arrangement of the teeth in the proventriculus has been used systematically in

\* Bulletin for Entomological Research, May 1913.

† Occas. Papers Cal. Acad. of Sci. vi. 1899, p. 145.

ants\* and in the Odonata Zygoptera†. In the Amblycera the crop-teeth assume characteristic forms in the different genera, and could be used with advantage in classification, as they are of generic if not specific value, and, as a rule, are easily visible through the integument in mounted specimens prepared with caustic potash.

The following is a short description of the position and nature of these teeth in different genera.



Fig. 1.

Sketch of alimentary canal of *Goniodes falcicornis*.

a, oesophagus; b, ventriculus; c, crop; d, patch of teeth.

#### ISCHNOCERA.

The crop in the Trichodeetidae is apparently devoid of teeth. I have carefully examined with a high power the

\* Sharpe, D., Camb. Nat. Hist., Insects, part i. p. 125.

† Higgins, Helen T., Proc. Nat. Sci. of Philadelphia, Jan. 1901.

mounted specimens of the genus *Trichodectes* in the collection of the British Museum, but no trace of teeth could be found.

In the crop of *Goniodes fulvicornis* (fig. 1, p. 267) there is a patch of small teeth in the anterior diverticulum of the crop (*d*). The teeth are arranged in short scattered rows of two, three, or four, and are short, sharp, and stout, with enlarged bases. The lining of the crop is grooved longitudinally, and along each groove is a row of wide-spaced, short, minute hairs.

This patch of teeth in the anterior cæcum of the crop is characteristic of the Ischnocera. I find similar patches in the same areas in *Nirmus* (*N. prodicepis*, D., *N. fuscus*, N., *N. dioxocephalus*, N.), *Goniodes stylifer*, N., *G. colchicus*, D., *Dochophorus alcedinis*, D., and *Lipeurus ferox*, Gieb. (fig. 2).

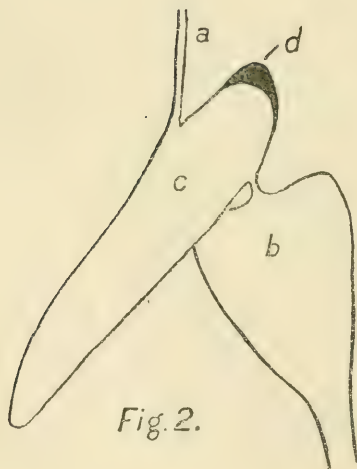


Fig. 2.

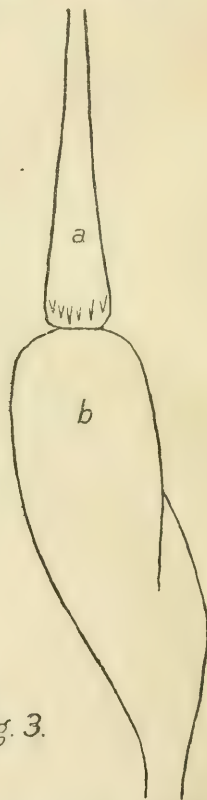


Fig. 3.

Fig. 2.—Sketch of the upper part of the alimentary canal of *Lipeurus ferox*.

Fig. 3.—Sketch of the upper part of the alimentary canal of *Heterodoxus longitarsus*.

*a*, oesophagus; *b*, ventriculus; *c*, crop; *d*, patch of teeth.



## AMBLYCERA.

*Heterodorus longitarsus* (Piaget) (fig. 3).—The crop is rather small, and the ventriculus, which follows, is parallel-sided, without anterior cæca. The teeth, situated in front of the opening into the ventriculus, point backwards, and are rather long, tapering, fairly broad, and numerous, arranged in a single row. In *Trimenopon echinoderma* there is a row of teeth of similar shape in the same position. But posteriorly there lie two chitinous flattened lobes, the free ends of the flaps being anterior and the two flaps being side by side, with a narrow longitudinal space between. The free projecting edges of the flaps possess a single row of minute denticles.

*Læmobothrium titan*, P.—The teeth are here grouped in two brush-like patches, one on each side of the base of the crop. The teeth are long, thin, round, acicular, curved, and closely set.

*Trinoton luridum*, N.—The teeth in this species are more developed than in any other genera I have examined up to the present. Seen *in situ* they please the eye with their beautiful symmetry of arrangement and their sabre-like shape. As usual they consist of a single row situated around the base of the crop, rather densely packed and of a dark brown colour. Each tooth is long (about .14 mm.), curved, flat, blade-like, parallel-sided, and at the base has a backwardly projecting sharp spur, which no doubt constitutes the place of attachment of the tooth to the lining of the crop. Just behind the row of teeth there are two patches, one on either side, of scattered teeth of quite a different character. These are long, curved, and round, of a white-coloured chitin. The rest of the crop shows numerous minute scattered bristles or teeth of a clear white chitin, the bases of which appear to be forked, suggesting sponge-spicules.

*Function.*

Plateau, who was able to speak with authority on the digestive arrangements of insects, formed the opinion that the proventricular teeth are used for straining rather than for masticating food. In the Amblycera it seems improbable that the teeth have any masticatory function, as they are long, slender, and sharp, and their development is not correlated with powerful muscular folds. In the Ischnocera the short scattered teeth may be of assistance in clearing out the food which collects in the anterior cæcum, where they are situated.

It has been suggested that some Mallophaga, such as *Tetrophtalmus titan* (P.), which is found firmly attached to the skin of the pelican's pouch, live on blood. This, if authenticated, is interesting when it is remembered that the Anoplura, true blood-sucking parasites, are, perhaps, in their descent Mallophaga which have taken to sucking blood.

A transition from hair- and feather-feeding to gnawing at the epidermis of the skin is easily conceived, when, as soon as blood is extravasated, it can be easily imagined how a further change in feeding-habits came about.

It is a pity that more is not known of the bionomics and feeding-habits of the Mallophaga.

### XXXI.—*A new Genus of Glossophagine Bat from Colombia.* By OLDFIELD THOMAS.

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#### LIONYCTERIS, g. n.

Allied to *Lonchophylla*, but the premolars without the characteristic Glossophagine elongation.

Interfemoral membrane well developed; tail reaching half-way to the back of the membrane.

Skull in general shape as in *Glossophaga*, the rostrum much shorter than in *Lonchophylla*. Zygomata imperfect. Palate extremely concave, domed, more so even than in *Lonchophylla*, its shape posteriorly much as in the latter genus, though it is less elongate. Basisphenoid pits present.

Dental formula I.  $\frac{2}{2}$ , C.  $\frac{1}{1}$ , PM.  $\frac{2}{3}$ , M.  $\frac{3}{3} \times 2 = 34$ , as in *Glossophaga* and *Lonchophylla*.

*Upper teeth.* Incisors disproportionate in size, as in *Lonchophylla*, the inner pair conspicuously longer than the outer, spatulate. Canines like those of *Lonchophylla*, but shorter. Premolars not narrowed and elongated horizontally, but more like those of ordinary *Vampyri*, the anterior one some little way from the canine, slender, pointed, unicuspid, its height greater than its horizontal diameter; posterior premolar triangular, pointed, with a small internal basal lobe and inconspicuous posterior basal cusp. Molars about as in *Glossophaga*,  $m^3$  less extended transversely.

*Lower teeth.* Incisors well developed, subequal, tricuspid. Canines rather weak. Premolars evenly increasing in size

backwards, their vertical greater than their horizontal diameter, triangular, pointed, with a high main cusp and the anterior and posterior secondary cusps quite low. In *Glossophaga* and *Lonchophylla* the lower premolars are elongate horizontally, especially the anterior one, which exceeds the second, and their secondary cusps are proportionally much more developed.

*Type*:—

*Lionycteris spurrelli*, sp. n.

Size and general appearance about as in *Glossophaga soricina*. Colour above bistre, the bases of the hairs darker and greyer, the ends paler, near "snuff-brown"; under surface rather paler, near "olive-brown" (Ridgway, 1912). In other *Glossophaginae* the bases of the hairs are lighter than the tips. Ears and nose-leaf apparently as in *Glossophaga soricina*.

Skull and teeth as described above.

Dimensions of the type (the italicized measurements taken in the flesh):—

Forearm 33 mm. (Specimen immature.)

Head and body 49; tail 7; ear 13; lower leg and hind foot (c. u.) 23.

Skull: greatest length 18.7; condylo-basal length 17.5; interorbital breadth 3.7; breadth across brain-case 8; palatal length 8.4; front of canine to back of  $m^3$  6.1; breadth between outer corners of  $m^2$  4.8.

*Hab.* Condoto, Choco, Colombia. Alt. 300'.

*Type.* Immature male (teeth unworn, outer incisors not fully erupted, and milk-incisor still present). B.M. no. 13. 8. 10. 1. Original number 314. Collected 10th May, 1913, by Dr. H. G. F. Spurrell. One specimen.

This genus, while clearly most related to *Lonchophylla* and *Glossophaga*, is readily recognizable by its quite normal and unmodified premolars, which have nothing of the peculiar horizontal lengthening of those of other *Glossophaginae*.

Even by its colour *Lionycteris spurrelli* is distinguishable from its allies, as other *Glossophaginae* bats have light bases to the fur, while here the bases are darker than the tips.

XXXII.—Ephemeridæ from Tropical Africa.

By the Rev. A. E. EATON, M.A., F.E.S.

REPORTING upon thirteen specimens of May-flies received from the British Museum of Natural History last July, it may be remarked that most of the species represented are in

many instances solitary specimens, more or less defective, that have been relaxed and spread out, and by being thus treated have suffered loss of, or detriment to, their body-markings. Where it was not justifiable in such circumstances to name an insect as a species, it has been deemed desirable to name as nearly as possible the genus to which it should be referred, noting, by illustration or description, characteristics likely to aid in the recognition of other specimens of the same species of flies from at least the identical localities. Some wings, detached, have been mounted in Canada balsam, to enable them to be examined and figured as to neurulation. Hind wings of dried May-flies are apt to be shrivelled up; if detached and let fall upon hot water they can usually be induced to unfold (with the exception of the marginal area) on the surface of the water. Taken up from that on thin glass or a feather, while thus expanded, they can, while moist, be floated off from it on to distilled water and cleaned without being submerged. Then, transferred in a similar manner to a prepared cover-glass for the object to be mounted for the microscope (already in position on the centring-card, and with bits of distance-glass in position, as well as the space for the object duly moistened), the wing can be adjusted upon the glass, and the ordinary method of preparation be completed. No attempt to submerge the wing afloat should be made prior to its being hardened in spirits.

ELASSONEURIA, Etn. (1881).

Related to *Oligoneuria*, Pictet (1843-5).

*Elassoneuria candida*, sp. n.

? Subimago ♀ (dried).—Wings dull, light, transparent smoky grey, with the stronger veins and cross-veins opaque, light sepia-grey. Cross-veins in the marginal area simple and indefinite (this area folded over); below the vein R<sup>1</sup> 13, within the sectorial fork 7, and 13 very faint and whitish below this fork and its stem. Epinotal prolongations of the wing-membranes, reaching to the base of the third dorsal segment, blackish. Dorso-lateral points of the ninth abdominal segment extend rather beyond the insertions of the caudal setæ. Last ventral plate, on each side of its terminal sinus, produced into a subacute point. Markings of the thorax and abdomen similar in character to those of the imago.



Adult ♀ (dried).—Wings white; the stronger veins and cross-veins whitish-brown; but the faint traces of finer obsolescent neuration between the strong veins subopaque white. Epinotal subulate continuations decurrent from the fore wing, defective, but also white. Cross-veinlets in the marginal area straight and simple, about 27 in number; 9 below  $R^1$  and 10 within the sectorial fork. Thorax largely eaten out by cabinet-pests; mesonotum brown ochreous, intersected lengthwise by a fine median black suture; scutum edged at the sides with whitish; this edging, opposite the fore wings, widened and joined together across the dorsum by a narrow,



*Elassoneuria candida*, sp. n.

Neuration of wings, with obsolescent interneural reticulation.

subtransverse, slightly retiring whitish band; prescutum, on each side of the front margin of the segment, flanked by a whitish spot or streak. Abdomen before oviposition dull green, owing to the eggs, but afterwards light drab-colour, with a narrow, black-bordered, medio-dorsal sepia-grey stripe from the second segment to the tip of the penultimate. Ventrally the nerve-ganglia and the nerve-chords for nearly half their length in front of each ganglion are black. Caudal setæ defective, Roman-sepia, with blackish joinings; the joints very short.

Length of wing about 21 mm.

*Hab.* Ilesha, S. Nigeria (*L. E. II. Humfrey*, 1911), no. 57.

Preparation of wings in Ca. balsam; Etn.

POLYMITARCYS, Etn. (1868).

Through misunderstanding a conversation with Dr. E. Joly

of Toulouse in 1880, I wrongly coupled together a defective subimago of *P. virgo*, Ol., and a nymph inhabiting the Garonne, naming them *Jolia roeseli* in 1881. Professor Joly could not show me the fly, which he had reared from nymphs of that kind; but in 1905 an allied American species was bred by Dr. J. G. Needham, Professor of Zoology at Lake Forest College, N.Y., and was identified with the genus named from the adult fly *Chirotonetes*, Etn. (1881). Simultaneously the nymph conjectured by me in that year to be a *Chirotonetes* was shown by Dr. Needham to be an *Ameletus*, Etn. (1881).

*Polymitarcys* sp.

A subimago, ♀ of a small species, deprived of caudal setæ. Fore wing, not fully extended, about 13 mm. long, dull, white, shaded very lightly from the costa to the radius, and the strongest of the longitudinal veins faintly tinged with reddish-violet grey; the remaining neuration whitish.

*Hab.* Zungeru, N. Nigeria (Nov. 1910); *J. W. Scott-Macfie*, 1911, 417. British Museum.

Prep. Part of hind wing in Ca. balsam; Etn.

*Polymitarcys* sp.

♀.—A larger insect than the preceding. Fore wing about 20 mm. long, dull, semitransparent, light warm sepia-grey, with opaque neuration. Setæ pilose.

*Hab.* Usangu District, German E. Africa (Nov. 29–Dec. 15, 1910). Alt. 3500–4500 ft.; *S. A. Neave*, 1911, 17, 7, British Museum.

Prep. Hind wing in Ca. balsam; Etn.

EPHEMERA, Linn. (1746), restricted Leach (1815).

Species of this genus appear to be less constant in the matter of wing-markings than has generally been supposed. Specimens bred in cool waters are much alike; but others of the same species that have inhabited warmer lakes or ditches might often be mistaken for quite different kinds at the first glance, the spots in their wings being more numerous and confluent, and the coloured edging of cross-veinlets broader or more pronounced. *Gregarine* may even produce modifications of markings in the abdomen in individual flies.

*Ephemera* sp.

Imago ♂ (dried).—Wings of a talcose gloss, transparent, tinted very faintly with a brownish adumbration, especially

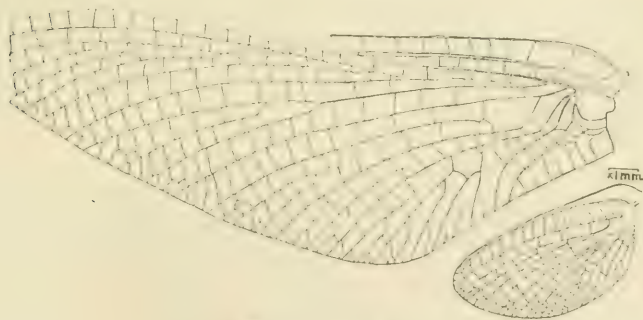
visible in parts not flattened out near the subcosta of the fore wing, and less strongly in a diffused cloud of moderate width extending from the tip along the outer margin of the hind wing; cross-veinlets also bordered narrowly with the same faint tint. Neuration piceous. In the fore wing the usual spots are almost obsolete, being represented only by a faint nebulosity just discernible in the immediate vicinity of the bifurcation of the median vein, and another even less visible at the near end of the long intercalar vein included in the cubital fork; in the hind wing no spot can be seen. In the figure both of the wings are incomplete, and cross-veinlets in the costal area (roughly sketched) are omitted. Cabinet-pests have left too little remaining of body, legs, and setæ for description, and the ♂ genitalia are ill displayed.

Approximate length of wing, ♂ im. 13, ♀ subim. 15 mm.

To this species are referred four defective specimens:—1 ♀ subim., Nyasaland, Domira Bay, W. shore of Lake Nyasa (18–21 Oct., 1910), *S. A. Neave*; 2 ♂ im., Uganda, Entebbe (11–12 Aug., 1911), *C. C. Goudey*, 1912, 70, British Museum; and 1 ♂ subim., Uganda Prot., Tero Forest, S.E. Buddu, 3800 ft. (26–30 Sept., 1911), *S. A. Neave*, Entomological Research Committee.

### PENTAGENIA, Walsh (1863).

A genus known hitherto from N. America only.



*Pentagenia* sp. ?

Neuration of wings, incomplete.

### ? *Pentagenia* sp.

Subimago ♀ (dried).—Wings dull, semitransparent, smoky whitish, with black neuration; the terminal margin outlined

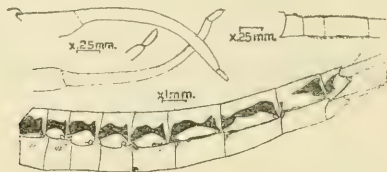
with grey-black and skirted by a narrow edging of a smoky tint shaded off inwards ; most of the longitudinal veins in the hind wings white. Abdomen probably yellowish white, with black markings, a somewhat serrated stripe on each side of the dorsum being the principal. Fore legs opaque, subluteous ; hinder legs of a lighter yellow, especially the tibiæ ; ungues and joinings of their tarsi dark.

Length of fore wing about 27 mm.

*Hab.* British E. Africa, Ilala, Maramas Dist., 14 miles E. of Mumias, 4500 feet alt. (June 18–21, 1911), *S. A. Neave* ; 1912, 20, British Museum.

### HEXAGENIA, Walsh (1863).

All species previously known are natives of N. and S. America and Asia respectively.



#### *Hexagenia (?) illustris*, sp. n.

Abdomen from the side, showing lateral markings of the dorsum ; the median seta (rudimentary), part of a lateral seta, and a limb of the ♂ forceps in dotted outline out of focus. Part of forceps ; the apical joint of one of them from a different standpoint ; and the base in profile of an outer caudal seta, on a uniform larger scale than the former detail.

#### *Hexagenia illustris*, sp. n.

Imago ♂ (dried).—Dorsum ivory-white down the middle, with black lateral markings above the spiracular line on the abdomen (see fig.) ; a broad fuscous stripe along each side of the meta- and mesonotum, black on the pronotum, and the pleura, below that, black as far as the insertions of the legs. Head black ; the space between the antennæ besides their first two joints whitish. The abdomen has in addition a fine abbreviated transverse line in the middle of the dorsal base of segment 9, a small triangular spot in segment 8, and a short acute triangular streak in segment 7, barely indicated in segment 6, all in corresponding positions, blackish. Venter spotless, except the joining at the base of segment 9, and, close



to it, a short streak on each side of the nervous track; also its apical border and a spot at the roots of the genitalia greyish or fuscous. Forceps: limbs elongate, somewhat darkened towards their extremities, and composed seemingly of only a single minute joint terminating the long basal joint. Wings transparent, vitreous, with light green and red-purple iridescence; fore wing in the costal and subcostal areas tinged with light yellow-amber; neuration black, excepting the bases of the veins posterior to the radius and the shortest venules of the anal group, and in the hind wing a large proportion of the longitudinal veins and a few of the cross-veinlets, which are whitish or not coloured. Fore legs lutescent; hinder legs flavescens or light yellow-amber, with the femora towards the tips and the tarsi tinged with traces of the former colour. Joints of the fore tarsus shortening from the longest, second subequal to third, fourth, fifth, first; hinder tarsi fifth, third, fourth (first indistinct). Setæ at the roots light burnt-umber brown, their joinings darker and the bases of the joints faintly tinged with the same, becoming gradually lighter; and then, in nearly their terminal halves, the outer tails become piceous or bistre-brown.

Length of body about 25, fore wing 22, outer setæ 65 mm.; median seta as long as the first two joints combined.

*Hab.* Uganda Protectorate, Mpanga Forest, 4800 ft. (13-23 November, 1911), *S. A. Neave*.

Three small fragmentary flies can be placed in the group of *Ecdyurus*:—

A single ♀ subim., captured on a tent-fly 300 yards from the river Mara-Mara, Liembwa Dist., Nyanza Prov., Brit. E. Africa (12 Dec., 1911), *C. M. Dobbs*, no. 52.—Hind tarsus: first joint longer than second and second longer than third joint. Fore tarsus: first joint equal in length to second and longer than third. Hind wings well developed. Femora each with a short, acute, longitudinal, black, recurrent apical streak near the lower edge, but no median dark band.

Affinities with *Epeorus*, Etn.

A single ♀ imago from N.E. Rhodesia, Niamadzi R., near Nawalia, at 2000 ft. alt. (17-22 Aug., 1910), *S. A. Neave*; 1911, 177, British Museum.—Hind tarsus (only one remaining) in course of reproduction, and therefore abnormal; fore legs beyond the trochanter lost.—*Sedis incerti*.

A single ♀ imago, labelled N. Nigeria, Zungeru (Nov. *Ann. & Mag. N. Hist.* Ser. 8. Vol. xii. 20

1910), *J. W. Scott-Macfie*; 1911, 417, British Museum.—Hind tarsus: first joint equal in length to second and longer than the third; fore legs beyond the trochanters lost; hinder femora not banded nor with any dark streak near the middle.—Sedis incerti.

To name such fragments would be foolish and reprehensible.

XXXIII.—*Fishes from Peru, collected by Dr. H. O. Forbes.*  
By C. TATE REGAN, M.A.

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A SMALL series of fishes from Peru, collected and presented to the British Museum by Dr. H. O. Forbes, is of some interest, as it includes the type of a new species of *Chirolophius*, an example of the little-known *Trachinotus paitensis*, and specimens of some Californian species not previously known to range southwards to Peru.

1. *Branchiostoma elongatum*, Sundev.

Lobos de Tierra, 5 to 8 fathoms.

2. *Lebiasina bimaculata*, Cuv. & Val.

Pacasmayo; fresh water.

3. *Tetragonopterus microphthalmus*, Günth.

Pacasmayo; fresh water.

4. *Tetragonopterus simus*, Bouleng.

Pacasmayo; fresh water.

5. *Vomer setipinnis*, Mitch.

Ferrol Bay.

6. *Trachinotus paitensis*, Cuv. & Val.

Hist. Nat. Poiss. viii. p. 438 (1831).

*Trachinotus paloma* (? Jord. & Starks), Starks, Proc. U.S. Nat. Mus. xxx. 1906, p. 786.

Depth of body  $2\frac{1}{4}$  in the length, length of head  $3\frac{2}{3}$ . Snout

as long as diameter of eye, which is 4 in the length of head; interorbital width 3. Snout obtuse; mouth nearly horizontal; maxillary extending to below middle of eye. 11 gill-rakers on lower part of anterior arch. Dorsal VI, I 28; longest rays a little more than  $\frac{1}{2}$  length of head. Anal II, I 24. Pectoral  $\frac{2}{3}$  the length of head. Silvery; back bluish; fins yellowish, with blackish points; dorsal lobe blackish.

A single specimen, 85 mm. in total length, from Lobos de Tierra.

The type of the species,  $2\frac{1}{2}$  inches long, from Paita, had 28 dorsal and 26 anal rays. Starks's specimen from Callao, 267 mm. in length to base of caudal, had a shorter head ( $4\frac{1}{2}$  in the length) and a smaller eye ( $6\frac{1}{2}$  in length of head) than the one described above.

7. *Larimus pacificus*, Jord. & Bollman.

Lobos de Tierra, 5 to 8 fathoms.

The type was taken in the Pacific between Panama and the Galapagos Islands.

8. *Hoplognathus insignis*, Kner.

Lobos de Tierra, 5 to 8 fathoms.

9. *Pomacentrus rectifrænum*, Gill.

Lobos de Tierra; rock-pools.

Not previously recorded south of Panama.

10. *Mugil cephalus*, Linn.

Pacasmayo; fresh water.

11. *Querimana harengus*, Günth.

Pacasmayo; fresh water.

12. *Polynemus approximans*, Lay & Benn.

Pacasmayo; fresh water.

13. *Gobius soporator*, Cuv. & Val.

Lobos de Tierra; rock-pools.

14. *Myxodagnus opercularis*, Gill.

Two examples from Lobos de Tierra, 8 to 10 fathoms, do

not seem to differ in any way from one from California, with which I have compared them.

15. *Symphurus atramentatus*.

Lobos de Tierra, 5 to 8 fathoms.

Previously known from specimens dredged off the coast of Colombia.

16. *Remora remora*, Linn.

17. *Remora clypeata*, Günth.

This species is represented in the British Museum collection by examples from the Cape and from Muscat; it does not seem to have been recorded from Peruvian waters; two examples, together with one of the preceding species, were taken from a large ray at Lobos de Tierra.

18. *Gobiesox zebra*, Jord. & Gilb.

I have compared specimens from the rock-pools of Lobos de Tierra with one from Mazatlan, and they seem to be the same species.

19. *Chirolophius forbesii*, sp. n.

Head longer than broad, about  $\frac{1}{2}$  the length of the fish. Diameter of eye 6 in length of head, less than length of snout or than interorbital width. Teeth in lower jaw in about 3 series; 2 teeth on each side of vomer. Nasal sacs small. A pair of divergent spines on each side of snout; each supraorbital ridge bearing two spines; humeral spine bifid posteriorly and with an outwardly directed process anteriorly. First ray of spinous dorsal less than  $\frac{1}{2}$  length of head, with terminal flap\*; second and third as long, fringed; fourth, fifth, and sixth well developed, the fourth almost free, the fifth and sixth connected by membrane basally. Soft dorsal with 8 rays, anal with 6, pectoral with 18. Lower surface of pectoral with blackish edge; distal half of anal and caudal blackish; caudal crossed by a row of pearl-like white spots, one on each ray; anal with one or two similar spots.

A single specimen, 170 mm. in total length, from Lobos de Tierra, at a depth of 8 to 10 fathoms.

\* This ray looks as though it had been broken off and the flap regenerated; perhaps it would be longer in a normal specimen.



XXXIV.—*Fishes from the River Ucayali, Peru, collected by Mr. Mounsey.* By C. TATE REGAN, M.A.

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1. *Tetragonopterus ovalis*, Günth.
2. *Gastrolepecus sternicla*, Linn.
3. *Callophysus lateralis*, Gill.
4. *Sorubim lima*, Schneid.

5. *Rhamdia mounseyi*, sp. n.

Depth of body 5 to 6 in the length, length of head  $3\frac{1}{2}$  to 4. Breadth of head  $1\frac{1}{4}$  to  $1\frac{1}{2}$  in its length, length of snout  $2\frac{3}{4}$  to 3, diameter of eye  $5\frac{1}{2}$  to 7, interorbital width  $2\frac{2}{3}$  to  $3\frac{1}{4}$ . Jaws equal anteriorly or the lower a little shorter than the upper; width of mouth nearly  $\frac{2}{3}$  width of head. Maxillary barbel extending beyond anal fin. Occipital process extending about  $\frac{2}{5}$  of the distance from its base to origin of dorsal fin. 4 or 5 gill-rakers + 2 or 3 rudiments on lower part of anterior arch. Dorsal I 6; spine slender; fin rounded. Length of adipose fin  $2\frac{3}{4}$  to  $3\frac{2}{5}$  in length of fish. Anal 9–11. Humeral process not reaching middle of pectoral spine, which is  $\frac{3}{4}$  to  $\frac{5}{6}$  the length of the fin, or  $\frac{1}{2}$  to  $\frac{2}{3}$  the length of head. Pelvics inserted below or a little behind last dorsal ray, sometimes reaching anal. Caudal deeply notched. Least depth of caudal peduncle  $2\frac{1}{3}$  to  $2\frac{2}{3}$  in length of head,  $1\frac{1}{2}$  to  $1\frac{3}{4}$  in distance from anal to caudal. Greyish; a lateral stripe; fins dusky, the dorsal pale at the base.

Seven specimens, 75 to 135 mm. in total length.

6. *Callichthys thoracatus*, Cuv. & Val.
7. *Corydoras elegans*, Steind.
8. *Xenocara cirrhosum*, Cuv. & Val.
9. *Hypoptopoma carinatum*, Steind.

10. *Loricariichthys ucayalensis*, sp. n.

Length of head a little more than  $\frac{1}{4}$  that of the fish. Breadth of head  $1\frac{1}{3}$  in its length, diameter of eye 7 to  $8\frac{1}{2}$ , interorbital width  $4\frac{1}{2}$  to  $4\frac{2}{3}$ , length of snout 2 to  $2\frac{1}{5}$ . Snout rounded; head smooth; orbital notch deep and broad.

Upper lip narrow; lower very broad, smooth, with entire edges; teeth minute, on each side about 8 in the upper jaw and 12 in the lower. 32 scutes in a longitudinal series, 20-22+10-12; lateral keels sharp, separate; scutes in front of dorsal fin with vestigial keels; lower surface of head naked; abdomen with 2 series of plates between the lateral series; anterior plates smaller, extending to level of middle of gill-opening; an anal plate, bordered anteriorly by 3. First dorsal ray  $\frac{5}{6}$  the length of head; pectoral spine reaching base of pelvic fin, which has the first branched ray longest; upper caudal ray produced. Breadth of body at level of first anal ray 4 in the distance thence to the caudal. Head and body with dark spots and blotches; fins, except the anal, with series of small dark spots.

Two specimens (males), 185 and 220 mm. in total length.

In the structure of the lower lip this species resembles males of *L. typus*, Bleek. In other characters it is nearer *L. maculata*, Bloch, but has a larger head, a shorter tail, and the dorsal and anal fins less elevated.

11. *Rhineloricaria konopickyi*, Steind.

12. *Loricaria carinata*, Casteln.

13. *Acara tetramerus*, Heck.

*A. duopunctata*, Haseman, seems to be a synonym of *A. tetramerus*. The two other supposed new species of this genus described by Haseman (Ann. Carnegie Mus. vii. 1911), from the Guaporé, viz. *A. guaporensis* and *A. awani*, are obviously the young and adult of one species, closely related to *A. paraguayensis*, even if it be distinct.

#### APISTOGRAMMA, nom. nov.

The recently published second volume of the 'Index Zoologicus' includes the generic name *Heterogramma*, Guenée, 1854. I therefore propose *Apistogramma* as a substitute for *Heterogramma*, Regan, 1906. This genus includes four species from the La Plata, *A. trifasciatum*, Eigenm. & Kennedy, 1903, *A. borellii*, Regan, 1906 (*H. ritense*, Haseman, 1911), *A. corumbæ*, Regan, 1906, and *A. pleurotænia*, Regan, 1909 (*H. borellii*, Haseman), two from Guiana, *A. steindachneri*, Regan, 1908, and *A. ortmanni*, Eigenm., 1912. There are perhaps four species known from the Amazon, viz., *A. amænus*, Cope, 1872, *A. taniatum*, Günth., 1862, *A. pertense*, Haseman, 1911, and *A. agassizii*, Steind., 1875.

14. *Apistogramma amœnus*, Cope.

Depth of body  $2\frac{1}{3}$  to  $2\frac{1}{2}$  in the length, length of head 3. Snout a little shorter than diameter of eye, which is  $3\frac{1}{3}$  to  $3\frac{1}{2}$  in length of head; interorbital width  $3\frac{2}{3}$  to 4. Maxillary extending to below anterior edge of eye; lower jaw  $\frac{2}{3}$  length of head; least depth of præorbital  $\frac{1}{3}$  to  $\frac{2}{3}$  diameter of eye; cheek with 3 or 4 series of scales; 2 or 3 gill-rakers of outer series below angle of first arch. 23 scales in a longitudinal series; 12 or 13 in upper lateral line, 5 or 6 in lower. Dorsal XV 6-7; spines subequal from the fifth, the last  $\frac{1}{2}$  the length of head or a little more. Anal III 6; third spine scarcely shorter than last of dorsal. Pectoral nearly as long as head, almost or quite reaching origin of anal; pelvics extending to second or third anal spine. Caudal rounded. Caudal peduncle deeper than long. Traces of cross-bars and of a lateral band; a dark spot at base of caudal; posterior part of soft dorsal and anal and middle of caudal barred with spots.

Two specimens, 50 and 55 mm. in total length.

*A. tæniatum*, Günth., seems to be known only from the type, 60 mm. in total length, from the Cupai; it differs from *A. amœnus* in the shorter snout and larger eye (diameter  $\frac{1}{3}$  length of head), larger mouth (maxillary to below anterior  $\frac{1}{3}$  of eye; lower jaw nearly  $\frac{1}{2}$  length of head), and higher dorsal spines, increasing in length to the last which is quite  $\frac{2}{3}$  the length of the head.

*A. pertense* is the species usually known as *H. tæniatum*; it is close to *A. amœnus*, but when specimens of the same size are compared it differs in the larger eye ( $\frac{1}{3}$  length of head) and more slender form (depth 3 in the length).

*A. agassizii* is distinguished by the pointed caudal fin.

XXXV.—*Contributions to a Knowledge of Oriental Rhynchota*. By W. L. DISTANT.

## HETEROPTERA.

## Fam. Pentatomidæ.

*Phricodus hystrix*.

*Aradus hystrix*, Germ. Silb. Rev. Ent. v. p. 134 (1837).

This well-known Ethiopian species must now be included in the fauna of British India. Mr. Bainbrigge Fletcher has sent us specimens from Coimbatore, South India.

Fam. *Lygæidæ*.*Oxycarenus lætus*.

*Oxycarenus lætus*, Kirby, J. Linn. Soc. Lond., Zool. xxiv. p. 102 (1891); Dist. Faun. Brit. Ind., Rhynch. ii. p. 43, fig. 31 (1904).

Kirby's type, when compared with fresh examples, was clearly founded on a discoloured specimen. I redescribed his type (*supra*), and so both of our descriptions fail in the character of the antennæ. These are not unicolorous, but with the second joint, excluding extreme apex, and the base of the third joint brownish ochraceous; our artist was also unhappy in his drawing of the rostrum, which really reaches to about the middle of the abdomen.

Fam. *Coreidæ*.

## NEOHOPLOLOMIA, gen. nov.

Head about as long as the pronotum; antenniferous tubercles prominent, armed with an obscure short outwardly and forwardly directed spine; antennæ pilose, first joint stoutest, about equal in length to head, second distinctly shorter than third, a little shorter than first, fourth fusiform; rostrum reaching the intermediate coxæ, first joint extending to latitude of eyes, second to about base of head, second and third subequal in length; pronotum with the posterior margin truncate before scutellum, lateral margins finely spinose, basal angles acute; scutellum not elevated; connexivum not prominently spined; posterior femora with their bases slender, incrassated towards their apices, beneath which they are prominently spinous.

Allied to *Hoplolomia*, Stål, differing by length of head and rostrum, and by the basal joint of antennæ not being shorter than head.

*Neohoplolomia typica*, sp. n.

Body above ochraceous; posterior area of pronotum and the clavus more or less suffused with castaneous; corium with obscure castaneous spots; apical joint of antennæ (excluding base), apical areas of posterior femora, apices of tibiæ, and transverse lines to connexivum, very dark castaneous or piceous; apex of rostrum and some small and inconstant spots on lateral areas of abdomen beneath piceous or black; membrane pale brownish with obscure greyish spots; basal lateral angles of pronotum shortly but distinctly spined; head above with a pale central longitudinal fascia; pronotum somewhat coarsely punctate; scutellum with the basal angles



and apex pale greyish and callose ; other structural characters as in generic diagnosis.

Long. 7 to 8 mm.

S. India ; Chikkaballapura (*T. V. Campbell*, Brit. Mus.).  
Presented by Mr. E. A. Butler.

## HOMOPTERA.

### Fam. Cicadidæ.

#### *Pycna indochinensis*, sp. n.

♂. Head, pronotum, and mesonotum ochraceous ; head with a small dark spot near base of front, vertex with a central longitudinal line, two small spots on each side of ocelli, and posterior margins of eyes black ; pronotum with three very small black spots at centre of posterior marginal area ; mesonotum with four obconical spots (the two central smallest) and a large spot in front of cruciform elevation black ; abdomen ochraceous, the segmental margins more or less broadly black ; tympanal flaps pale ochraceous ; body beneath, legs, and rostrum ochraceous ; central sulcation to face, apex of rostrum, and large marginal spots to abdomen black ; tegmina with the basal half ochraceous, opaque, two elongate spots on costal membrane, three in radial area (the central spot largest), the basal cell and a large elongate spot beneath it black, other more piceous and more obscure spots between the veins, and in the radial area a large hyaline space between the second and third black spots ; outer half of tegmina hyaline, the veins ochraceous, a number of small black spots on the apical marginal area and larger piceous suffusions at the bases of the upper four apical areas ; wings black, the apical and posterior marginal area hyaline ; head (including eyes) about two-thirds the breadth of base of mesonotum ; pronotal lateral margins angularly ampliate ; face very broadly, blackly, centrally sulcate for about half its length, the transverse striations pitchy brown ; rostrum reaching base of abdomen ; opercula short and broad, internally overlapping, outwardly and posteriorly rounded, not passing base of abdomen.

Long., excl. tegm., 17 mm. ; exp. tegm. 63 mm.

*Hab.* Indo-China ; Lao Kay (*R. Vitalis de Salvaza*, Brit. Mus.).

Allied to *P. celestia*, Dist. ; face much more shortly centrally sulcate, pronotal margins more acutely angulate, opercula less centrally overlapping, basal coloration of the tegmina different, &c.

## SALVAZANA, gen. nov.

♂. Head somewhat transversely truncate between the eyes, including which it is narrower than the base of mesonotum, its length about half the breadth between eyes; ocelli nearly twice the distance from eyes as from each other, front slightly prominent; pronotum slightly shorter than mesonotum, its lateral margins oblique and sinuate, the posterior angles a little sinuate; abdomen broad and robust, about as long as space between the apex of head and base of cruciform elevation, the tympanal orifices completely concealed by the tympanal coverings; opercula in male not passing the base of abdomen; metasternum elevated at middle and furnished with a posterior process directed backward; rostrum almost reaching the posterior coxæ; tegmina about two and a half times as long as greatest breadth, apical areas eight, basal cell longer than broad; wings more than half the length of tegmina, apical areas six.

Allied to *Cryptotympana*, but head narrower than base of mesonotum, opercula in male not passing base of abdomen and convex, &c.

*Salvazana mirabilis*, sp. n.

♂. Body black; head with narrow posterior margin and a spot on lateral margins of vertex castaneous; pronotum with narrow anterior and broad posterior margins castaneous; mesonotum with a tri-arcuate spot in front of cruciform elevation and a spot at base and on each side of same castaneous; body beneath black, brownishly pilose, outer halves of the opercula castaneous; abdominal stigmatal spots pearly white; tegmina with about basal third olivaceous green outwardly defined by black suffusions, remaining two-thirds subhyaline, the veins greenish, the apical margin, spots at apices of veins to apical areas, and suffused spots at apices of the two upper ulnar areas piceous; costal membrane castaneous, postcostal membrane black; wings with about basal halves white, opaque, outwardly defined by a transverse piceous fascia, which is connected with piceous apical and postcostal margins which surround an apical hyaline area; anterior femora armed beneath with a basal and two subapical spines; the opercula rounded, moderately convex, very narrowly separated internally, not quite reaching base of abdomen; face convexly depressed, centrally longitudinally sulcate, transverse ridges distinct but only moderately prominent; metasternal plate longitudinally sulcate; other structural characters as in generic diagnosis.

Long., excl. tegm., ♂ 43 mm.; exp. tegm. 130 mm.

*Hab.* Indo-China (*R. Vitalis de Salvaza*, Brit. Mus.).

I have not yet seen the female of this beautiful species.

*Gæana vitalisi*, sp. n.

Black; narrow anterior margin and broad posterior margin of pronotum, two central longitudinal fasciæ (inwardly angulated), and a discal elongate sublateral spot to mesonotum ochraceous, probably virescent in living or fresh specimens; tegmina black, somewhat opaque, the venation virescent, a curved transverse spot near base, an irregular-shaped spot crossing third ulnar area, and a smaller spot crossing first ulnar area, and a submarginal apical series of irregularly shaped spots ochraceous or pale virescent; wings shining black, a broad streak on abdominal area, two contiguous streaks above it, a subapical spot, two contiguous spots near costal margin, and a subcentral spot above posterior margin ochraceous or pale virescent; head longer than pronotum, front somewhat porrectly produced, face prominent, transverse striations somewhat prominent; opercula not quite reaching base of abdomen, strongly concavely sinuate internally, slightly sinuate externally, apex transversely convex.

Long., excl. tegm., ♀ 32 to 35 mm.; exp. tegm. 90 to 95 mm.

*Hab.* Indo-China (*R. Vitalis de Salvaza*, Brit. Mus.).

Allied to *G. festiva*, Fabr.

*Balinta pulchella*, sp. n.

♂. Body and legs black; front of head, basal margin of vertex, two central angulated fasciæ and posterior margin to pronotum, the lateral margins, and two central and inwardly angulated fasciæ to mesonotum, which are united to the anterior angles of the basal cruciform elevation, ochraceous; tegmina bronzy brown with a white subcostal spot before apex; wings pitchy black with the basal area ochraceous; tegmina a little less at greatest breadth than one-third of their length, in addition to the white subcostal spot there is a much more obsolete spot crossing base of lower apical area; head not longer than pronotum, obliquely depressed in front of eyes; face prominent, ochraceous with two central longitudinal black fasciæ which are united before reaching clypeus; rostrum reaching, or very slightly passing, the posterior coxæ; opercula short, longer than broad, apically rounded, not quite reaching base of abdomen, a little inwardly oblique.

Long., excl. tegm., 20 mm.; exp. tegm. 48 mm.

*Hab.* Indo-China (*R. Vitalis de Salvaza*, Brit. Mus.).

XXXVI.—On a *Kangaroo* and a new *Palm-Civet* in the  
*British Museum*. By ERNST SCHWARZ.

Two years ago ('Annals,' ser. 8, vol. vii. p. 609, 1911) Mr. Thomas described a Wallaroo from McClintock Range, Kimberley Gold Field, Far North of Western Australia. In his description he expressed some doubts as to the constancy of the cranial characters used by me to separate the different local races of *M. robustus*. I have recently had an opportunity of examining the type of *Macropus robustus bracteator*, and by the kind permission of Mr. Thomas I am enabled to give the following supplementary description of the skull in a form closely resembling the diagnoses in my paper in 'Novitates Zoologicae,' vol. xvii. (1910).

*Macropus robustus bracteator*, Thomas.

*Skull.* Basifacial axis short as compared to basicranial axis. Nasal cavity strongly inflated laterally almost as much as in *M. r. rubens*, but slightly less (especially when viewed from the palate). Nasals very convex in both directions, as already shown by Mr. Thomas, long, broad, and almost parallel-sided. *Processus infrazygomaticus* narrow and strongly twisted. Zygoma as in *M. r. woodwardi*. Opening of lacrymal canal in lacrymal bone. *Foramina incisiva* short. Anterior portion of palate exactly as in *M. r. woodwardi*, its margins regularly converging anteriorly, and not constricted in front as in *M. r. rubens*, its least breadth about half the length of diastema. Profile of skull strongly and regularly convex, its highest point in the frontal region.

Basicranial axis 47 mm.; basifacial axis 120; facial index 255.

The skull of this kangaroo is most like that of *M. r. rubens*. As in that form, it has a low facial index and the inflated nasal cavity, which, however, is slightly less marked, so as to be somewhat intermediate between *rubens* and *woodwardi*. The shape of the nasals and palate are more as in *woodwardi*.

In the local races of *Macropus robustus* the facial index seems to be very constant, whereas in *M. rufus* and *M. giganteus* it is extremely variable.

In laying out the series of *Paguma grayi* in the British Museum together with Mr. Wroughton, the specimens from



the Western Himalayas were found to represent a distinct race, which Mr. Wroughton was to describe. In the meantime, however, he has left England for some time to come, and I have much pleasure now in naming this new form after Mr. Wroughton himself, whose interest in Indian mammalogy is so well known.

*Paguma grayi wroughtoni*, subsp. n.

*Type-locality*. Gharial, Punjab.

*Type*. ♂ ad. B.M. no. 7. 11. 21. 12. Collected by Major H. N. Dunn, and presented by him to the British Museum.

Related to *P. g. grayi*, but with blackish neck and yellowish hue on posterior back. Face-markings more distinct and underside buffy, not yellowish white.

Underfur of whole upperside slaty grey, of underside buffy. Hairs of neck glossy black, often with a narrow greyish subterminal band. Hairs of back black for their basal half, those of anterior back with narrow yellowish band and broad black tip, those of posterior back with very broad golden-yellow band and short black tip. Tail like posterior back for the greater part of its length, with black tip. Sides of body pale yellowish grey, hairs with short black tips; limbs similar, but the hairs without the black tips; fingers and toes dark brown. Ears black. Face-markings comparatively prominent, but far less so than in *P. larvata*. Underside buffy; hairs of throat with broad white tips; chin blackish brown, darker than in *P. g. grayi*.

*Skull*. Much as in *P. g. grayi*. Protocone of  $p^4$  better developed.

*Dimensions of type*. Basal length of skull 115 mm.; palatal length 60·5; palatal breadth 41; zygomatic width 67; width of brain-case 40·5; intertemporal constriction 21; nasals  $25\cdot2 \times 13$ ; length of carnassial 8·7; length of foramina incisiva 8.

This *Paguma* is the western representative of *P. grayi grayi* of Nepal, from which it is at once distinguishable by the blackish neck and the shape of the cheek-teeth. There are six specimens in the British Museum—one from Simla, one from "India," one stated to be from Nepal (but, as collected by Dhuleep Singh, probably from somewhere in the Punjab), and two from the type-locality, Gharial, Punjab.

XXXVII.—*Brief Descriptions of new Thysanoptera*. — I.

By RICHARD S. BAGNALL, F.L.S., F.E.S. (Hope Department of Zoology, University Museum, Oxford).

IN this series of papers I propose to shortly describe new Thysanoptera, or thrips, from various parts of the world, though the collections in my hands at present are chiefly from Africa and India. This material, for which my hearty thanks is due, has been received from many sources, which I will more particularly mention in several larger contributions now in preparation.

I am especially anxious to have material from Australia, Japan, Asia (particularly from the north and west), Central and South Africa, South America, and the Polynesian and other groups of islands.

## Suborder TEREBRANTIA.

## Family Thripidæ.

*Retithrips bicolor*, sp. n. (Vine thrips).

♀.—Length about 1·6 mm.

Rich golden-yellow, tinged lightly with brown; head, mesothorax, and metathorax (the latter anteriorly and laterally only) dark brown; legs yellow and antennæ light lemon-yellow. Sculpture and reticulation very strong. Vertex of head broadly raised, arcuate, with a median break; cheeks converging from behind eyes, slightly sinuate. Maxillary palpi apparently 4-jointed, the basal joint as long as the other three (? or two) together. Antennæ set below vertex, distant at base, very slender, and more than twice as long as the head; joints 3 to 6 more or less claviform; 3 as long as the two basal joints together, 4 slightly shorter than 3, and 5 and 6 about two-thirds ( $\frac{2}{3}$ ) the length of 4. Prothorax shorter than the head. Wings with cilia (which are smoky brown) on lower margins only; lower wing with dark median vein from base to apex.

In my two preparations with wings expanded I have been, as yet, unable to make out any arrangement of spines.

♂.—Length 1·15 mm.

Abdominal sternites 3 to 7 (? 2 to 6) with a roundish pale depression. Tenth abdominal segment with a pair of stout lateral bristles, which are apically strongly flattened out in the form of a broad V, with the apex truncate.

*Hab.* Ceylon, on vine (*E. E. Green*).

Readily separated from *Retithrips ægypticus*, Marchal, by its coloration, the long slender antennæ, and the shape of joints 3 to 6, and the longer and more slender wings. Dr. Marchal does not describe any special characteristics of the ♂ *ægypticus*.

*Heliothrips indicus*, sp. n.

♀.—Length 1·2 mm.

In *fasciatus*, *fasciapennis*, and *phaseoli* group, but readily distinguished by the male characteristics. Type of coloration (except wings) and form of antennæ as in *fasciatus*. Maxillary palpi two-segmented. Wings overreaching tip of abdomen; fore-wings white, tinged with grey at base, second and third fourths wholly grey-brown, decidedly lighter in middle, though the colouring is not broken; apical fifth grey-brown. Venation as in *fasciapennis*; basal vein set with two basal spines and one near fork; upper vein (fused with costa) with two near fork and two near apex; lower vein with five or six (usually 2 + 3 + 1) more or less regularly placed spines.

♂.—Length 1·0 mm.

Ninth tergite with six rather long dorsal spines, one set on each side of the mid-line at a little distance from the posterior margin, and the other four in a line (but the inner pair set wider apart than the first-named pair) near the posterior margin. Abdominal sternites 3 to 7 with a strongly transverse pale area or depression, more or less arcuate, gradually lessening in size from the fourth to the seventh segment, the former being about fifteen and the latter eight times as wide as long. In *cinctipennis*, Hood, these pale areas are almost round, in *fasciatus*, Perg., they are transversely ovate, whilst in *fasciapennis*, Hinds, and *phaseoli*, Hood, they are transverse, but only five and nine times as long as wide respectively, and not arcuate.

*Hab.* INDIA: Sirsiah, Bengal, in numbers on indigo, 1908; and Surat, Bengal, on onions, berseem, and brinjal, February 1909 (*Maxwell Lefroy*).

*Euthrips* (*Anaphothrips*) *alternans*, sp. n. (Maize thrips).

♀.—Length 1·3 to 1·4 mm.

Head and first two abdominal segments dark grey-brown; pterothorax yellowish-brown to grey-brown; abdominal segments 7 to 10 dark chestnut-brown, 6 generally a similar or lighter chestnut-brown; prothorax, legs, and abdominal segments 3 to 5 yellow, at most lightly tinged with grey.

Antennal joint 1 light grey-brown; 2 darker brown, concolorous with the head; 3 clear lemon-yellow; 4 also yellow, but slightly deeper, and in some specimens tinged lightly with grey; 5 (except base, which is light) to 8 chestnut-brown. Wings very light grey; a dark greyish-brown patch across each fore wing from the basal fifth to about the middle; hind vein with dark median vein extending almost to tip.

Head as long as, or very slightly longer than, broad, about as long as the prothorax, and 0.5 the length of the antennæ. Antennal joint 6 not divided; prothorax without setæ at posterior angles. Wings broad near base, a few spines on both upper and lower veins of fore wing, irregularly placed and inconspicuous.

*Hab.* EGYPT: Bahteem, near Cairo, May 1st, 1911, common on maize (*E. C. Willcocks*).

*E. alternans* closely approaches *E. sudanensis* (Tryb.), but is sharply distinguished by the lighter basal joint of antennæ, the yellow prothorax, and the long head. It is also a larger insect.

*Physothrips lefroyi*, sp. n. (Tea-flower thrips).

A very distinctive species.

♀.—Length 1.4 to 1.7 mm.

Yellowish-white, lemon-yellow to yellow in darker specimens; bristles, cilia of wings, and antennal joints 2, 4, and 6 rich reddish brown. Antennal joint 4 basally yellow, and 5 only lightly tinged with reddish brown. Relative length of joints 3 to 8 as follows:—26 : 26 : 21 : 21 : 3 : 5.

Spines in upper vein of fore wing 2+3 near base, 1 near middle, and 2 in distal third. Apical abdominal spines long.

♂.—Slightly smaller. Ninth tergite with six stout dorsal spines; four moderately long, forming an obverse arc, and a pair of shorter and stouter ones placed on a higher plane and medianly within the circumference of the arc. Spines and cilia more lightly coloured and antennæ practically unicolorous.

*Hab.* INDIA: Lebong, Darjeeling, Bengal, in the flowers of tea, Feb. 6th, 1909 (*Maxwell Lefroy*).

Named in honour of Prof. Maxwell Lefroy.

*Physothrips funtumiæ*, sp. n. (Rubber thrips).

♀.—Length 1.45 to 1.6 mm.

Colour dark grey-brown; legs rather lighter and fore-tibiæ



yellowish-brown to yellowish-white at tips; intermediate (and usually hind) tibiae yellowish-white at tips. Fore-wings and cilia smoky yellowish-brown, lighter at base. Eyes coarsely faceted, pilose. Relative lengths of antennal joints 3 to 8 as follows:—20 (with stem) : 20 : 16 : 21 : 4·5 : 7·5. Third broader than any of the succeeding joints; fifth and sixth rather slender. Prothoracic bristles at posterior angles 0·65 the length of the prothorax. Legs sparingly clothed with setae. Upper vein of fore-wing with 3+3 spines in the basal half near base, and only two spines in the distal half, together near tip. Apical abdominal spines long.

♂.—Length 1·0 to 1·1 mm., and more slender than ♀.

Each of the sternites 3 to 7 with a strongly transverse pale depression near upper margin\*, and numerous, more or less small, irregular (but inclined to be roundish) areas of a similar nature placed irregularly over the whole of the surface. Ninth tergite with four short, stout, dorsal spines in the form of an obverse arc, inner pair more apical and shorter than the outer pair. Colour lighter; third antennal joint yellowish-white and joints 4 to 6 also yellowish-white in their basal halves.

*Hab.* AFRICA: on rubber-trees (*Funtumia elastica*), Uganda and Southern Nigeria (from several correspondents).

*Physothrips usitatus*, sp. n.

♀.—Length 1·6 mm.

Near *P. sjöstedti* (Tryb.). Colour brown, third antennal joint yellowish-brown to greyish-yellow; fore-femora (in *sjöstedti* dark) yellow, lightly tinged with brown, especially on the outer margin; fore-tibiae, all tarsi, and intermediate and hind-tibiae at extreme apices yellow. Fore-wing lightly tinged with brown at extreme base; clear to basal third and thence brown to apex, with a lighter patch just before apex; mid-vein of hind-wing extending to apex, brown; all spines and cilia dark. Head almost as long as broad and not quite as long as prothorax. Interocular bristles long. Antennae 2·5 times as long as the head; relative lengths of joints:—13 : 15 : 23 : 23 : 14 : 21 : 6 : 8. Double trichomes on joints 3 and 4 long and stout. Middle joint of maxillary palpi the shortest. Upper vein of fore-wing with three basal bristles, a series of 11 (10–13) commencing at about the first fourth and running to, or just into, the distal third, and 2 at extreme apex; lower vein with series of 13 (12–15) bristles com-

\* These may be broken up into a line of smaller depressions.

mencing at basal third. Body elongate, only slightly broader than the pterothorax. Apical segment about 0.2 shorter than ninth abdominal segment; bristles long, nearly as long as the two apical segments together.

This species differs from both *sjöstedti* (Tryb.) and *variabilis*, sp. n., in the long series of bristles in the lower vein commencing at the basal third, instead of with the corresponding series of upper vein at the basal fourth.

*Hab.* INDIA: Allahabad, in flowers of *Butea frondosa* (A. D. Inms).

*Physothrips variabilis*, sp. n.

♀.—Length 1.1 to 1.6 mm.

Near *sjöstedti* (Tryb.) and *usitatus*, sp. n., but broader. Dark specimens dark chestnut-brown; third antennal joint yellow; fore-tibiæ yellowish; intermediate and hind-tibiæ grey-brown; all tarsi yellowish. Light specimens light-grey to yellowish-brown; pterothorax lighter and abdominal segments 1 to 7 yellowish, only slightly tinged with grey-brown. Fore-wings and cilia light greyish-yellow, a lighter patch near apex; basal third clear. Upper vein with three basal spines, a series of 9 to 14 commencing at about the first fourth, and running well into the distal fourth on to the distal fifth; 2 at extreme apex. Spines of lower vein commencing also at the distal fourth. Head transverse, shorter than prothorax; eyes pilose. Relative lengths of antennal joints 3 to 8:—23 : 24 : 16 : 24 : 5 : 6. Double trichomes on segments 3 and 4 very large. Abdominal bristles long. Legs sparingly spinose.

Differs from *sjöstedti* (Tryb.) and *usitatus*, sp. n., by the broad form and transverse head and by the long series of spines in the upper vein of fore-wing extending to beyond the basal fourth.

*Hab.* COMORO ISLANDS?: "R. Oberthür, Coll. Marie. Mayotte?" (Leyden Museum).

*Thrips assimilis*, sp. n.

♀.—Length 1.1 mm.

Closely resembles *T. albopilosus*, Uzel, but is larger and differs in the following particulars:—Relative lengths of antennal joints 3 to 7:—18 : 15 : 12 : 18 : 6; 5 distinctly shorter than 4 and 5 and 6 both broader than 3 or 4. Upper vein in fore-wing with 12 bristles, viz. 6 + 1 in basal half and 5, more or less regularly placed, in distal half.

*Hab.* TUNIS: Sousse, 1 ♀, Feb. 28th, 1903 (Biro).

## Suborder TUBULIFERA.

## Family Phlæothripidæ.

*Compsothrips reuteri*, sp. n.\*

♀.—Length about 2·0 mm.

Dark chestnut-brown, including legs and tarsi. Basal antennal joint brown; 2 shaded to yellow apically; 3 clear yellowish-white; 4 to 6 yellow, with 5 lightly and 6 more strongly shaded with brown apically; 7 brown and 8 yellowish-brown, lighter than 7. Head about 2·5 times as long as the prothorax, and 1·75 as long as broad behind eyes; cheeks slightly arcuate at about the posterior third. Pterothorax slightly longer than broad. Abdomen oblong-ovate, sharply narrowed from segment 8 to base of tube. Tube about 0·6 the length of the head and less than half (0·5) as broad at apex as at base. Legs long.

Resembles *C. (Leurothrips) linearis* (Bagn.) in type of coloration, but may be recognized by its smaller size, broader, more ovate, and shorter body, and the relatively longer head and legs.

*Hab.* EGYPT: Suez, 1 ♀, Aug. 4th, 1902 (*Biro*).

*Cryptothrips trybomi*, sp. n.†

♂.—Winged; length just over 2·0 mm.

Colour chestnut-brown, head yellowish brown, and tip of tube lighter; all legs yellow, wings tinged lemon-yellow; antennæ yellowish-brown, joint 3 lemon-yellow and 4 a deeper yellow. Head about 1·6 times as long as broad and 2·2 as long as the prothorax. Mouth-cone broadly rounded, extending to mesosternum. Eyes rather small, vertex raised. Ocelli large; postocular bristles present. Antennæ 1·75 times as long as head, joints 3 and 4 mildly claviform, and 5 and 6 elongate-fusiform, almost cylindrical. Prothorax strongly transverse, 2·5 times as wide through middle as long; all bristles present, long and light-coloured. Legs long. Nine cilia near apex of fore wing duplicated. Abdomen elongate; tube 0·6 the length of the head.

*Hab.* GERMAN EAST AFRICA: Moschi, Aug. 15th, 1905, 1 ♂ (*C. Katona*).

Easily distinguished by its type of coloration and by the unusual form of the antennal joints 5 and 6.

\* Named in honour of Prof. O. M. Reuter, Helsingfors.

† Named in honour of the late Dr. Filip Trybom of Stockholm.

*Cryptothrips citricornis*, sp. n.♂.—Forma *aptera*.

Length about 2.5 mm.

Elongate and linear. Colour chestnut to grey-brown; metathorax and abdominal segments 1 to 7 lighter, tinged with yellow. Antennæ yellow, sixth joint very faintly and the penultimate and apical joints tinged with grey; all femora grey-brown, with the extreme apices faintly yellowish; all tibiæ and tarsi lemon-yellow. Hypodermal pigmentation deep and widely diffused.

Head almost as in *icarus*, Uz., not quite 1.5 as long as broad just behind the eyes (where it is broadest), and nearly twice as long as the prothorax, which is strongly transverse. Ocelli moderately large, remote from inner margins of eyes. Postocular and all prothoracic setæ well developed, yellow. Wings and wing-retaining spines absent. Tube about 0.65 the length of the head and 2.3 times as long as broad at base. Apical bristles nearly as long as tube.

Related to *icarus*, Uz., from which it may be distinguished by its larger size, more elongated body, and also by its yellow antennæ, and the dark femora and light yellow tibiæ.

*Hab.* GERMAN EAST AFRICA: Arusha, Oct. and Nov., 1905 (*C. Katona*).

*Haplothrips karnyi*, sp. n.\*

♀.—Length about 1.9 mm.

Colour dark grey-brown; crimson hypodermal pigmentation widely diffused; fore-tibiæ yellowish. Antennal joints 3 to 5 light yellow; 6 also yellow, tinged with light greyish-brown apically; 7 yellowish grey-brown, and 8 darker brown. Wings with a smoky tinge. Head and prothorax almost as in *kilimandjaricus* (Tryb.); head 1.35 as long as broad and about 1.5 times as long as the prothorax. Postocular and all prothoracic setæ long and stout, knobbed. Mouth-cone reaching a little more than halfway across prosternum. Prothorax 1.6 broader than long. Fore-tarsus with a small tooth. Posterior margin of fore-wing with seven cilia duplicated near apex. Tube 0.6 the length of head; abdominal bristles long and moderately stout, wing-retaining bristles stout.

*H. karnyi* comes nearest to *calhircensis* (Tryb.) and *kilimandjaricus* (Tryb.), differing from both in the more greatly developed postocular and prothoracic setæ, and in the long

\* Named in honour of Dr. H. Karny of Elbogen.



abdominal bristles, those on segments 7 to 9 being nearly as long as the tube. It differs from *usitatus* (Bagn.) in this latter respect and also in the longer head and prothorax.

*Hab.* GERMAN EAST AFRICA; Arusha, Oct. and Nov., 1905 (*C. Katona*).

*Haplothrips longisetis*, sp. n.

♀.—Length about 1.75 mm.

Elongate and linear. Brown, first abdominal segments somewhat lighter; tube darker basally; femora grey-brown; tibiae yellow, tinged with brown on the outer margin and basally; third antennal joint yellow, fourth rather lighter brown than the succeeding joints. Wings colourless, transparent, posterior margin of fore-wing with four cilia duplicated near apex. Head 1.14 as long as broad, about 1.25 as long as the prothorax, and about 0.6 the length of the antennæ. Mouth-cone very short and rounded. Prothorax 1.6 as broad as long; all setæ present, knobbed. Fore-tarsus with prominent tooth. Tube 0.58 the length of the head; apical setæ exceptionally long, 2.25 times as long as the tube; those on ninth abdominal segment 1.5 the length of the tube.

*H. longisetis* comes in the *aculeatus* group, but is readily recognized by the long apical abdominal hairs.

*Hab.* ALEXANDRIA: one example found in a dead twig of fig (*Ficus* sp.), March 6th, 1905.

Submitted by Mr. F. V. Theobald.

*Haplothrips brevicollis*, sp. n.

♀.—This species has the fore-tarsus unarmed and comes nearest to *cahirensis* (Tryb.). It may be separated from all the species in that group, however, by its very short and strongly transverse prothorax. The head is nearly 0.9 as broad as long and 1.85 times the length of the prothorax, which latter is 2.3 times as broad as long. The tube is 0.6 the length of the head. The posterior margin of the fore-wing has six cilia duplicated near the posterior margin.

*Hab.* AFRICA: Kibosho, 1903 (*Kittenberger*).

*Hoplandrothrips hoodi*, sp. n.\*

Forma *macroptera*.—Length 1.2 to 1.5 mm.

Colour yellowish-brown to grey-brown; tube grey-brown,

\* Named in honour of the American Thysanopterist, Mr. Douglas Hood.

darker near basal third and laterally. Antennæ with joints 1 to 3 yellow; 4 and 5 light brown, with basal thirds yellow; 6 light brown, with basal fourth yellow; 7 and 8 brown. All femora light brown, shaded to yellow apically; fore-tibiæ yellow, and intermediate and hind-tibiæ yellowish distally and basally. Hypodermal pigmentation thick.

Head twice as long as prothorax and about 1·25 times as long as wide; cheeks bulging behind eyes, and from thence converging to base. Eyes finely faceted; ocelli moderately large. Postocular bristles present, knobbed. Mouth-cone extending across prosternum. Antennæ more than twice as long as the head. Prothorax strongly transverse, 2·3 times as wide through middle as long; all bristles present, knobbed. Nine cilia near apex of fore-wing duplicated. Fore-legs stout and tarsi armed; fore-tibia in the ♂ with one tooth near base, and femur with two teeth near apex within; in the ♀ simple. Abdomen roundly narrowed from segment 6 to base of tube. Tube about 0·5 times the length of head. Apical bristles almost as long as tube. Abdominal bristles well-developed; segments 3 to 8 with one shorter stout pair and one straight knobbed pair.

*Forma aptera*.—Wings and wing-retaining spines absent.

*Hab.* GERMAN EAST AFRICA: Arusha, f. *macroptera*, 1 ♂, f. *aptera*, 1 ♂ and 1 ♀, Oct.–Nov., 1905 (*C. Katona*).

*Trichothrips longicornis*, sp. n.

*Forma aptera*.—Length about 1·6 mm.

Yellowish to chestnut-brown, head and abdomen generally darker; tube shaded to yellow at apex. Fore-tibia, at least apically, yellowish; basally and along the upper and lower margins dark brown. Antennæ with basal joint concolorous with head; 2 yellowish, tinged with brown basally; 3 to 6 clear lemon-yellow, 6 sometimes faintly tinged and 7 and 8 very lightly tinged with brown.

Head quadrate, only 0·08 longer than broad and about 1·5 times as long as the prothorax; cheeks parallel to basal fourth, then slightly narrowed posteriorly. Eyes well-developed; front ocellus facing forwards; postocular bristles long. Mouth-cone broadly rounded, not quite reaching across the prosternum. Antennæ about 2·2 times the length of head, set below vertex; relative lengths of antennal joints 3 to 8 as follows:—20 : 19 : 20 : 21 : 23 : 18; two apical joints slender.

Prothorax transverse, 0·5 as long as broad; pterothorax nearly as broad as the width across fore-coxæ, slightly

broader than long. Abdomen elongate, almost parallel to segment 7. Tube about 0·7 the length of the head. Abdominal spines pointed.

Nearest *T. jémoralis*, Moulton, from which it may be distinguished by the shorter and more transverse prothorax, the relative lengths of the distal antennal joints, the shorter tube, and the colour of the fore-tibia and tube.

*Hab.* WEST AFRICA: Sierra Leone.

Numerous dried specimens in the British Museum.

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XXXVIII.—*Descriptions of new Species of Pyralidæ of the Subfamily Pyraustinae.* By Sir GEORGE F. HAMPSON, Bart., F.Z.S., &c.

[Continued from p. 38.]

(7 b) *Tegostoma confluentalis*, sp. n.

♀. Head, thorax, and abdomen white tinged with pale brown. Fore wing reddish brown; the base suffused with white; the costal edge white; an oblique white medial band, straight from costa to vein 1, then curved outwards and joining at inner margin the rather strong, obliquely curved, yellowish-white postmedial line; termen narrowly white; cilia white. Hind wing white slightly tinged with brown.

*Hab.* EGYPT (*Fortescue*), 1 ♀ type. *Exp.* 26 mm.

(8 a) *Tegostoma anæmica*, sp. n.

♂. Head, thorax, and abdomen whitish tinged with pale red-brown. Fore wing pale red-brown; an oblique yellowish-white postmedial band defined on outer side by red-brown. Hind wing pale red-brown.

*Hab.* BALUCHISTAN, Mekran Coast, Ormara (*Cumming*), 1 ♂ type. *Exp.* 12 mm.

(8 a) *Noctuelia tristrigalis*, sp. n.

Black; fore coxæ and mid femora with white streaks; abdomen with the ventral surface white except at extremity; anal tuft white. Fore wing with orange-yellow patch from base extending below costa to beyond middle and to tornus, leaving the costa and inner margin narrowly black, its outer

edge straight, oblique, the subcostal and median nervures and vein 1 streaked with black. Hind wing uniform black, the underside somewhat brown.

*Hab.* BRAZIL, Castro Paraña, 1 ♂ type, type ♀ in Coll. Schaus. *Exp.* 28 mm.

(9 a) *Noctuelia auranticeps*, sp. n.

♂. Head and tegulæ orange, the palpi at tips, frons, and antennæ black; thorax and abdomen glossy blackish brown, the latter with the genital tufts whitish. Fore wing brown with a faint olive tinge, the veins blackish. Hind wing black-brown slightly glossed with silvery blue; the underside more strongly suffused with silvery blue.

*Hab.* PERU, Pucuzo, 2 ♂ type. *Exp.* 28 mm.

(10 a) *Noctuelia mesozonalis*, sp. n.

♀. Palpi orange, brown at tips; frons and antennæ brown; vertex of head and base of tegulæ orange; thorax brown; pectus and legs pale yellow, the fore tibiæ with fuscous bands at extremity; abdomen dorsally brown, with orange sides and pale yellow ventral surface, the extremity brown. Fore wing red-brown with oblique pale yellow medial band expanding somewhat towards costa. Hind wing orange with broad brown terminal band expanding somewhat at discal fold and narrowing towards tornus.

*Hab.* ARGENTINA, Florenzia, Gran Chaco (*Wagner*), 1 ♀ type. *Exp.* 22 mm.

(17 a) *Noctuelia annuliferalis*, sp. n.

♂. White; head tinged with red-brown; palpi dark brown, white below; tegulæ with brown line at base; patagia with brown bars; legs tinged with brown; abdomen with diffused dark brown segmental lines. Fore wing yellowish white, with red-brown markings filled in with pure white; a brown point below base of cell and oblique striga from base of costa conjoined by brown suffusion on costa to the brown outline of two conjoined antemedial white spots in and below the cell, the inner rather triangular, the outer round, and each connected with inner margin by a brown line; a rounded white spot defined by brown in end of cell and a quadrate spot below end of cell connected with the inner margin by an oblique brown line; the veins beyond the cell streaked with brown; a conical postmedial white patch defined by brown from costa to vein 4, its inner defining line



not reaching costa, but bent round to the spots in end of cell, a rounded spot below and beyond it between veins 5 and 2, and a lunulate spot nearer base in submedian interspace; beyond the conical and rounded marks are six small white spots in the interspaces defined by brown; a fine brown terminal line; cilia pure white with three small brown spots at middle. Hind wing white, the termen tinged with yellow; a brown medial line from below costa to vein 1, forming a fork in and just below end of cell; postmedial line strongly excurved between veins 5 and 2 and ending on termen at vein 1, where it is rather irregular, and with a brown bar across its sinus; a minutely waved subterminal line, slightly excurved between veins 5 and 2, where it terminates; a fine brown terminal line; cilia pure white, with series of small brown spots from apex to vein 2.

*Hab.* TRANSVAAL, Pretoria (*Janse*), 1 ♀; BASUTOLAND, Masite (*Weigall*), 1 ♂ type; C. COLONY, Kokstad (*Mrs. Pringle*), 1 ♂. *Exp.* 26 mm.

(17 b) *Noctuelia albidalis*, sp. n.

♀. White. Fore wing with the costal area faintly tinged with brown to the postmedial line; a slight medial rufous striga above vein 1; postmedial line represented by an oblique rufous line from costa to vein 7, then a faint line with a few dark scales on it from vein 6 nearer termen to vein 1, oblique and slightly sinuous below vein 4, with a faint rather diffused rufous line beyond it from vein 3 to inner margin; a rather diffused, minutely waved, rufous subterminal line, indistinct below vein 4; a fine black terminal line; cilia with a slight rufous line through them. Hind wing with the terminal area tinged with brown; a fine black terminal line except towards tornus; cilia with a faint brown line near base, the tips tinged with brown at apex and submedian interspace.

*Hab.* PERSIAN GULF, Fao (*Cumming*), 1 ♀ type. *Exp.* 20 mm.

GENUS STENOPTYCHA.

	Type.
<i>Stenoptycha</i> , Zell. Stett. ent. Zeit. 1863, p. 154 . . . . .	<i>celodactyla</i> .
<i>Atomopteryx</i> , Wlsm. Ent. Mo. Mag. xxvii. p. 216	
(1891) . . . . .	<i>doeri</i> .

Hind wing with veins 4, 5 coincident, arising from the cell or stalked with vein 3.

A. Fore wing with semicircular postmedial dark mark below costa.

a. Fore wing with the semicircular mark oblique and produced at outer extremity . . . . . *erschaffiana*.

- b.* Fore wing with the semicircular mark not oblique or produced at outer extremity.  
*a'*. Fore wing with the subterminal line obtusely angled outwards below apex.  
*a*<sup>2</sup>. Fore wing with the ground-colour bright rufous ..... *cælodactyla*.  
*b*<sup>2</sup>. Fore wing with the ground-colour purplish red-brown..... *peruviana*.  
*b'*. Fore wing with the subterminal line acutely angled outwards below apex ..... *incalis*.  
*B.* Fore wing without semicircular postmedial dark mark below costa.  
*a.* Fore wing with the subterminal line very acutely angled outwards below apex, then sharply bent inwards..... *serpentifera*.  
*b.* Fore wing with the subterminal line less acutely angled outwards below apex, then incurved .... *pterophoralis*.  
*c.* Fore wing with the subterminal line evenly and obliquely curved below the angle below apex .. *doeri*.

- (1) *Stenoptycha erschoffiana*, Zell. Hor. Ent. Soc. Ross. xiii. p. 457, pl. vi. fig. 159 (1877).

*Hab.* COLOMBIA.

- (2) *Stenoptycha cælodactyla*, Zell. Stett. ent. Zeit. 1863, p. 154, pl. ii. fig. 12.

*Stenoptycha lindigi*, Feld. Reis. Nov. pl. cxi. fig. 61 (1874).

*Stenoptycha zelleri*, Butl. Trans. Ent. Soc. 1883, p. 57.

*Agathodes dubitalis*, Maasen, Stübel's Reise, p. 170, pl. ix. fig. 21 (1890).

*Hab.* MEXICO; COSTA RICA; COLOMBIA; ECUADOR; CHILI.

- (3) *Stenoptycha peruviana*, Zell. Hor. Ent. Soc. Ross. xiii. p. 457 (1877).

*Hab.* PERU; ARGENTINA.

(4) *Stenoptycha incalis*, sp. n.

♂. Head, thorax, and abdomen purplish rufous mixed with some dark brown; antennæ brownish ringed with white, whitish towards tips; fore tibiæ with blackish band at extremity, the tarsi white with black band at extremity of first joint; hind tibiæ and tarsi white; abdomen with minute oblique subdorsal white streaks on first segment and small subdorsal blackish spots on medial segments. Fore wing purplish rufous slightly irrorated and in parts suffused with brown; a slight dark antemedial shade on costal area and minute tuft of raised blackish scales defined by a white

annulus on inner area; the discal fold thinly scaled from before end of cell to termen, some whitish scales above it in end of cell; a rather semicircular whitish mark from below end of cell to inner margin; a hoop-shaped black mark below the costa beyond end of cell; some oblique brown striæ from apical part of costa; subterminal line indistinct, dark, slightly defined on outer side by whitish, angled outwards below costa, then incurved to vein 4, where it is angled outwards, then oblique and very minutely waved to above inner margin; a narrow terminal dark band slightly defined on inner side by a whitish line; cilia brown, white at tips towards tornus. Hind wing semihyaline white; the veins towards end of cell brownish; a fine dark terminal line expanding into a slight patch at vein 2 and emitting a short streak on extremity of vein 1; cilia with a slight dark line at middle towards apex and some brown at vein 2; the underside with the costa brown.

*Hab.* PERU, Cuzco Mts. (*Garlepp*), 1 ♂ type. *Exp.* 24 mm.

(5) *Stenoptycha serpentifera*, sp. n.

Head, thorax, and abdomen purplish rufous mixed with some dark brown; antennæ slightly ringed with blackish towards base, whitish towards tips; fore tibiæ with dark band at extremity, the hind tibiæ and the tarsi whitish; abdomen with whitish dorsal patch at base, the medial segments with subdorsal blackish spots. Fore wing purplish rufous irrorated with blackish; an antemedial black striga from costa and rather triangular dark shade on inner area; a brown spot defined by blackish in middle of cell, its upper extremity produced; a medial black line defined on outer side by whitish from cell to inner margin, acutely angled outwards in submedian fold; the discal fold thinly scaled from middle of cell to near termen; an oblique brown band defined by blackish from below costa at end of cell to submedian fold, its upper extremity somewhat produced on inner and outer sides; subterminal line blackish slightly defined on outer side by whitish except towards costa, acutely angled outwards below costa, then strongly bent inwards and slightly angled outwards at vein 4, at submedian fold curving inwards and joining the oblique band; some slight dark spots on apical part of costa; a series of black striæ slightly defined on inner side by white before termen; cilia brown, white at tips towards tornus. Hind wing pale brown, the inner area whitish, with three oblique dark bars; a small dark postmedial spot on vein 2 with

some dark irrorations before and beyond it; cilia white with a brown line near base from apex to vein 2 and intersected with brown at tips at veins 3 and 5.

*Hab.* BAHAMAS, Nassau (*Sir G. Carter, Bonhote*), 4 ♀ type; CUBA, Santiago (*Schaus*), 1 ♀, Matanzas (*Schaus*), 1 ♂. *Exp.* 16–20 mm.

(6) *Stenoptycha pterophoralis*, Wlk. xxxiv. 1340 (1865).

*Hab.* BAHAMAS; JAMAICA; CUBA; ST. DOMINGO; ANTIGUA; COLOMBIA; BR. GUIANA.

(7) *Stenoptycha doeri*, Wlsm. Ent. Mo. Mag. xxvii. p. 216 (1891), and Nov. Lep. pl. xii. fig. 1.

*Hab.* MEXICO; COLOMBIA; BOLIVIA; S. BRAZIL.

#### *Auctorum.*

*Stenoptycha unicolor*, Hering, Stett. ent. Zeit. lxvii. p. 147 (1906).

PERU.

#### Genus LINEODES.

	Type.
<i>Lineodes</i> , Guen. Delt. & Pyr. p. 234 (1854) . . . . .	<i>hieroglyphalis</i> .
<i>Scoptonoma</i> , Zell. Verh. zool.-bot. Ges. Wien, xxiii. p. 328 (1873) . . . . .	<i>integra</i> .
A. Hind wing with comet-shaped brown discoidal mark defined by black.	
a. Hind wing hyaline except the terminal area.	
a'. Ground-colour of fore wing and terminal area of hind wing bright red-brown . . . . .	<i>hieroglyphalis</i> .
b'. Ground-colour of fore wing and terminal area of hind wing dull reddish brown . . . . .	<i>convolutalis</i> .
b. Hind wing brown, with a hyaline bar beyond the discoidal mark . . . . .	<i>peterseni</i> .
B. Hind wing with small brown spots defined by black at upper and lower angles of cell.	
a. Hind wing hyaline, the postmedial line well separated from the lower discoidal spot . . . . .	<i>tridentalis</i> .
b. Hind wing tinged with brown, the postmedial line connected with the lower discoidal spot . . . . .	<i>encystalis</i> .
C. Hind wing with brown annulus defined by black and some black irroration in centre at lower angle of cell . . . . .	<i>latipennis</i> .
D. Hind wing without brown discoidal marks defined by black.	
Hind wing with short curved black streak below vein 2 near its base.	
Fore wing with triangular white mark in end of cell.	



- a*<sup>2</sup>. Fore wing with the triangular mark in end of cell defined by black.  
*a*<sup>3</sup>. Fore wing with the triangular mark in end of cell produced at lower extremity ..... *dianalis*.  
*b*<sup>3</sup>. Fore wing with the triangular mark in end of cell not produced at lower extremity .. *tipuloides*.  
*b*<sup>2</sup>. Fore wing with the triangular mark in end of cell not defined by black ..... *hamulalis*.  
*b'*. Fore wing with curved white fascia defined by black in lower extremity of cell ..... *leucostrigalis*.  
*b*. Hind wing without black streak below vein 2.  
*a*<sup>1</sup>. Fore wing with the subterminal line bent inwards at vein 3 and not forming a sinus below that point.  
*a*<sup>2</sup>. Fore wing with curved white streak defined by black in lower extremity of cell ..... *integra*.  
*b*<sup>2</sup>. Fore wing with triangular white mark defined by black in end of cell.  
*a*<sup>3</sup>. Fore wing with the triangular mark in end of cell produced at lower extremity ..... *interrupta*.  
*b*<sup>3</sup>. Fore wing with the triangular mark in end of cell not produced at lower extremity .. *contortalis*.  
*b'*. Fore wing with the subterminal line forming a sinus below vein 3.  
*a*<sup>2</sup>. Fore wing with the sinus of the postmedial line short and broad.  
*a*<sup>3</sup>. Fore wing with curved white fascia defined by black in lower extremity of cell ..... *mesodonta*.  
*b*<sup>3</sup>. Fore wing with conical white mark slightly defined by blackish in end of cell ..... *aztecalis*.  
*c*<sup>3</sup>. Fore wing with diffused whitish mark not defined by black in end of cell.  
*a*<sup>1</sup>. Fore wing grey-brown strongly irrorated with black ..... *subextincta*.  
*b*<sup>1</sup>. Fore wing ochreous tinged with rufous and slightly irrorated with black ..... *ochrea*.  
*b*<sup>2</sup>. Fore wing with the sinus of the subterminal line long and narrow.  
*a*<sup>3</sup>. Fore wing with triangular white mark defined by black in end of cell ..... *fontella*.  
*b*<sup>3</sup>. Fore wing with conical white mark irrorated with brown in end of cell.  
*a*<sup>4</sup>. Fore wing pale red-brown ..... *undulata*.  
*b*<sup>4</sup>. Fore wing dark brown irrorated with blackish.  
*a*<sup>5</sup>. Fore wing with round dark spot in middle of cell defined by a Y-shaped whitish band ..... *cyclophora*.  
*b*<sup>5</sup>. Fore wing with the dark spot in middle of cell defined by a small white spot on inner side and irregular band on outer ..... *serpularis*.  
*c*<sup>1</sup>. Fore wing without subterminal line ..... *polychroalis*.

(1) *Lineodes hieroglyphalis*, Guen. Delt. & Pyr. p. 235. pl. iii. fig. 6 (1854).

*Hab.* BOLIVIA; S. BRAZIL.

(2) *Lineodes convolutalis*, sp. n.

*Lineodes hieroglyphalis*, Druce, Biol. Centr.-Am., Hct. ii. p. 264 (nec Guen.).

♀. Head, thorax, and abdomen red-brown mixed with some dark brown; palpi with some whitish in front; frons with lateral white lines. Fore wing pale red-brown irrorated with dark brown; an antemedial whitish patch from cell to inner margin, its outer edge angled outwards in submedian fold; an oblique wedge-shaped white patch defined by black from middle of costa to median nervure; a triangular white patch defined by black in end of cell, its lower edge concave, its inner extremity conjoined to an oblique white mark below the cell, with its outer edge angled on vein 2, and with an oblique black line before its outer edge extending to inner margin; a small white spot on costa above end of cell; subterminal line black defined on each side by white to discal fold, then on outer side only, acutely angled outwards below apex, then incurved, and at submedian fold curving inwards and upwards to the outer extremity of the triangular patch in end of cell; two minute white spots on costa towards apex; a white line before termen from below apex to above vein 4 which is defined above and below by white streaks extending to the subterminal line; a curved white striga above tornus confluent with the sinus of the subterminal line. Hind wing semihyaline whitish, the inner area tinged with brown; a comet-shaped brown discoidal mark defined by blackish, its head turned downwards and extending to submedian fold; postmedial line black slightly defined on outer side by whitish, oblique, ending at vein 2, the area beyond it fuscous to the slightly sinuous white subterminal line, defined on outer side by blackish and also ending at vein 2; a terminal ochreous-brown band to vein 2; cilia whitish, with a black line through them.

*Hab.* COSTA RICA, Irazu (*Rogers*), 2 ♀ type, Candelaria Mts. (*Underwood*), 1 ♀, Godman-Salvin Coll. *Exp.* 22 mm.

(3) *Lineodes peterseni*, sp. n., Wlsm.

*Scoptonoma peterseni*, Z. MS., Meyr. Tr. Ent. Soc. Lond. 1886, 2 (1886) LN.

Antennæ cinereous, spotted with fuscous. Palpi cinereous, with a dark brown stripe externally. Head chestnut-brown, interspersed with a few whitish scales; a dark brown shade, margined with whitish, projects forward from the antennæ. Thorax brownish fuscous, the patagia and tegulae mottled

with cinereous. Fore wings brown, tinged with ferruginous toward the base of the dorsum, much mottled with darker shades, and with several curved and angulated dark brownish-fuscous streaks margined with white; the first, within the basal fourth, narrowly margined with white on both sides; the second, about the middle of the wing, angulate outward, margined widely on the inner and narrowly on the outer side with white; above these are two lunate semitransparent white patches, the first small, communicating narrowly with the second, which is larger and dark-margined; beyond this conspicuous white patch is an inwardly curved dark fuscous streak, narrowly pale-margined; this is followed by a more important curved and angulate line of the same colour, its acute outer angle pointing toward the apex and reverting to the costa; this line is also margined with white; beneath this, and extending nearly to the apex, is a dark quadrate patch containing two pale brownish lines, margined on its lower and outer edge by a narrow white line, sharply angulate inward above the middle of the termen, parallel to which it runs thence nearly to the tornus; three or four costal streaks, toward the apex, appear to continue the ornamentation produced by some conspicuous dark interruptions in the pale cilia of the termen. *Exp. al.* 21–22 mm. Hind wings brownish fuscous, with white and dark fuscous spots and lines; about the middle of the wing is a dark fuscous spot, preceded by a small pale space, and followed by a larger one, around the edge of which, except at its costal extremity, runs a dark fuscous line margined with white; a dark fuscous line along the termen is preceded by a narrow white line and followed by a darker fuscous line in the dirty whitish cilia. Abdomen pale brownish, with darker lateral lines. Legs brownish; the anterior tibiæ fringed at the end with fuscous scales.

Type ♂ (101631) Mus. Wlsm. (*Zell. Coll.*) B.M. [PT. (101643) Mus. Meyr.].

*Hab.* COLOMBIA (*Petersen*); Jiminez, 1600 ft., III. 1907 (*W. F. H. Rosenberg*). Eight specimens.

Seven specimens of this species were in the Zeller Collection labelled "*Scoptonoma peterseni*, Z. lit. Columbia"; one of these specimens (101643) is referred to by Meyrick (*Tr. Ent. Soc. Lond.* 1886, 2).

(4) *Lineodes tridentalis*, sp. n.

♂. Head, thorax, and abdomen reddish brown mixed with some white and blackish; palpi with black mark on first joint, the second joint black above, the third joint black;

frons with black streaks at sides; antennæ with the shaft ringed with blackish towards base; fore tibiæ blackish on inner side, the hind tibiæ blackish at extremity, the tarsi ochreous white; abdomen with blackish segmental lines except at base. Fore wing rufous slightly suffused in parts with fuscous; an antemedial white spot in submedian interspace, with black striæ at middle and on outer edge, an oblique wedge-shaped white spot defined at sides by black beyond it in cell; a triangular white patch defined by black in end of cell, its lower edge somewhat concave, its inner extremity conjoined to an oblique bidentate white spot defined by black in submedian interspace, defined by white on outer side with a black point beyond its upper tooth and a black striga from it to inner margin; two whitish points on postmedial part of costa; subterminal line black, defined on each side by white towards costa, acutely angled outwards below apex, then incurved, excurved at middle, and at submedian fold retracted upwards to the outer extremity of the triangular patch in end of cell; a black line before termen defined on inner side by a narrow white band edged with black from just below costa to discal fold, where it expands on inner side into a spot, then slightly defined on inner side by white; a fine minutely waved black terminal line not extending to apex; cilia white, with black marks at apex, middle, and tornus. Hind wing semihyaline whitish, the inner area tinged with brown; slight brownish spots at upper angle of cell and below lower angle, the latter with black striga on its outer edge; a sinuous blackish subterminal line from costa to vein 2; the terminal area brown except towards tornus, with a sinuous blackish line defined on inner side by whitish from costa to vein 2; cilia white, with a black line near base; the underside with the costa suffused with red-brown, black spots on subcostal nervure at middle and end of cell, the subterminal line strong and black from costa to discal fold.

*Hab.* BR. GUIANA (*Rodway*), 1 ♂ type; BOLIVIA, 1 ♂. *Exp.* 18–20 mm.

(5) *Lineodes encystalis*, sp. n.

♀. Head, thorax, and abdomen ochreous mixed with red-brown; palpi yellowish, with some black scales on first joint, the second joint black behind, the third joint black; frons with black and white streaks at sides; abdomen with lateral tuft of blackish scales except towards base. Fore wing yellowish suffused with red-brown and slightly irrorated with blackish; an antemedial white bar on inner area defined



at sides by black, an oblique white bar defined at sides by black beyond it from costa; a triangular white patch defined by black in end of cell, its lower edge rather concave, its inner extremity conjoined to a bidentate white mark in submedian interspace, with a bidentate black line near its outer edge and an oblique black striga from it to inner margin; two white points on postmedial part of costa; subterminal line black, defined on each side by white to discal fold, acutely angled outwards below apex, then incurved, slightly angled outwards at vein 4, and at vein 3 bent inwards and upwards to the outer extremity of the triangular white patch in end of cell; a minutely waved black line defined on inner side by white before termen from below apex to discal fold, where it expands into a small wedge-shaped spot, and a fine sinuous white line from vein 3 to tornus; cilia white chequered with black towards apex, at middle, and at tornus. Hind wing whitish suffused with brown; a small blackish annulus with blackish point in centre below end of cell; a slight sinuous, oblique, blackish, postmedial line from costa to submedian fold; traces of a sinuous whitish line before termen from costa to submedian fold; cilia white, with a black line through them; the underside with patches of blackish scales on subcostal nervure at middle and end of cell, and an oblique, rather diffused, black postmedial line from costa to discal fold.

*Hab.* GRENADA, Mount Gay (*H. H. Smith*), 3 ♀ type; ST. VINCENT (*H. H. Smith*), 1 ♀. \* *Exp.* 18 mm.

(6*a*) *Lineodes latipennis*, sp. n., Wlsm.

Antennæ cinereous. Palpi cinereous, mottled externally with dark brown scales. Head ferruginous brown; face dirty whitish, shaded with ferruginous brown, a dark brown spot between the eyes. Thorax ferruginous, mottled anteriorly and laterally with dark brown, and posteriorly with dark brown and dirty whitish scales. Fore wings ferruginous brown, streaked and mottled with dark fuscous scales, with a pale basal patch and two semitransparent quadrate costal spots, and some white costal streaks before the apex; at the base, occupying almost one-third of the dorsum, but narrowed towards the costa, is a creamy white basal patch with some admixture of pale ferruginous scales, containing two dark spots—one dorsal, at the extreme base, the other subcostal, slightly removed from the base; on the costa, at about one-third, is a slightly oblique, dark-margined, semitransparent, iridescent, pearly white patch,

followed by a larger quadrate patch of the same colour on the middle of the costa, also bordered by a narrow dark fuscous line which is continued beneath along the cubitus; on the costa toward the apex are three oblique white streaks, the first and largest containing a dark fuscous line, sharply angulate outwardly toward the apex, and continued in an undulating course, nearly parallel with the termen, until it approaches the tornus, where it is bent backward and upward toward the costa, slightly below which it is connected with the outer border of the quadrate white spot; before this line the dorsal half of the wing is much clouded with dark fuscous, and beyond it an elongate dark cloud precedes the upper half of the termen, on which are three white streaks running through the ferruginous darkly mottled cilia. *Exp. al.* 17 mm. Hind wings similar to the fore wings in ornamentation and colouring; with a quadrate, semi-transparent, iridescent, pearly white patch about the middle of the wing in the basal half, produced narrowly upward toward the costa, margined on either side by dark fuscous lines, and followed by dark fuscous shading, interrupted in the middle by the paler ground-colour, through which run two transverse fuscous lines; the middle of the dorsum is shaded with dark fuscous, a whitish streak running through the ferruginous cilia below the apex. Abdomen dirty whitish, mottled at the base and sides with dark fuscous scales. Legs: posterior tibiae nearly three times the length of the femora, cinereous; the tarsi dirty whitish; anterior tibiae and tarsi white, stained with pale ferruginous, a conspicuous fringe of mottled fuscous scales at the end of the tibiae.

Type ♀ (101642) Mus. Wlsm. (*Zell. Coll.*). B.M.

*Hab.* COLOMBIA (*Petersen*). Unique.

(7) *Lineodes dianalis*, sp. n.

Red-brown; palpi pale at base, blackish at tips; frons with lateral white streaks; patagia and metathorax with slight black spots; abdomen with dorsal and lateral series of blackish points and sublateral fuscous streaks. Fore wing slightly suffused with blackish; subbasal black points on costa and in cell; antemedial line black, defined by white on inner side, acutely angled outwards on median nervure, and very oblique towards costa and inner margin; an oblique white striga on costa above end of cell; postmedial line black, defined by yellowish white on outer side and also on inner side below the cell, obliquely incurved from costa to

vein 5, where it is very acutely angled, then retracted to upper angle of cell, oblique to origin of vein 2, on which it is angled outwards, then oblique to inner margin; subterminal line black defined by white on outer side, very acutely angled outwards below apex, then strongly incurved to vein 5, and prominently defined by white on each side, forming a lunulate mark, oblique between veins 5 and 2, then retracted with an outward curve to the angle of post-medial line and running as a fine streak to lower angle of cell, a black patch beyond it below apex; a white line just before termen, incurved below apex, excurved at middle, then incurved; cilia black at base, white at tips. Hind wing yellowish suffused with brown, the costal area and terminal area to vein 2 red-brown; the inner margin suffused with black towards tornus; a brown discoidal spot conjoined to the costal area; an oblique slightly sinuous black postmedial line from vein 4 to submedian fold, with black striga before it below vein 2; a slightly sinuous white subterminal line; cilia black at base, white at tips.

*Hab.* BRAZIL, São Paulo (Jones), 1 ♂ type, Rio Janeiro, Tijuca (Wagner), 1 ♂, 1 ♀. *Exp.* 24 mm.

(8) *Lineodes tipuloides*, Wlsm. P. Z. S. 1891, p. 493.

*Hab.* TRINIDAD.

(9) *Lineodes hamulalis*, sp. n.

♀. Head and thorax pale grey-brown; palpi blackish; frons with black lateral streaks; abdomen pale grey-brown tinged with rufous except at base, some black irroration at sides. Fore wing pale grey-brown suffused in parts with rufous; an oblique whitish antemedial line from cell to inner margin, slightly defined at sides by blackish scales; an ill-defined whitish triangular patch in end of cell, an oblique whitish band from its inner extremity to inner margin, with a slight blackish line near its outer edge; an oblique wedge-shaped discoidal mark, defined by black except above; some small black spots on apical part of costa; subterminal line black, defined on each side by whitish to discal fold, then on outer side only, acutely angled outwards below apex, then incurved, excurved at middle, then oblique, at submedian fold forming a hook and retracted upwards to the discoidal mark, some black suffusion beyond it at discal fold before the whitish line before termen which is excurved at middle, incurved above and below middle, and with black points beyond it at discal fold and tornus. Hind wing whitish



suffused with brown ; a minute blackish annulus at upper angle of cell ; a minute streak below lower angle and some black striae on inner area ; traces of a sinuous blackish subterminal line ; a rather punctiform black terminal line slightly defined on inner side by whitish ; cilia white, with a black line through them ; the underside with the costal area irrorated with black, a black spot at upper angle of cell, the subterminal line more distinct and angled inwards at discal fold.

*Hab.* ARGENTINA, Tucuman (*Dinelly*), 1 ♀ type. *Exp.* 24 mm.

(10) *Lineodes leucostrigalis*, sp. n.

♂. Red-brown ; palpi pale, with black bars at extremity of first joint and tips ; frons black at base of sides, then with lateral white streaks ; pectus and legs pale ; abdomen pale ochreous, with lateral red-brown fasciae. Fore wing with the costal area pale, with two linear red-brown marks defined by black towards apex ; antemedial line slight, black, defined by white on inner side below the cell, acutely angled outwards on median nervure and very oblique toward costa and inner margin ; postmedial line black, arising from below costa, oblique to vein 4, where it is acutely angled, then retracted to upper angle of cell, and with curved yellowish streak below it, then oblique to origin of vein 2, on which it is acutely angled outwards, then oblique to inner margin and defined on each side by pale yellow ; subterminal line black, defined on outer side by white from costa to vein 5, forming a very elongate and acute tooth outwards below apex, then very strongly incurved to vein 5 and defined by white also on inner side, again bent outwards, oblique and slightly sinuous to vein 2, then retracted to angle of postmedial line and forming a slight streak to lower angle of cell, a black patch beyond its sinus, defined by white on outer and lower sides and with fine white streaks on the two veins traversing it ; a strigiform white subterminal line between veins 5 and 1, angled inwards in submedian fold ; a fine black terminal line ; cilia chequered black and white. Hind wing pale yellowish, the terminal area red-brown from apex to vein 1, very broad at costa and angled inwards at discal and submedian folds ; a blackish patch at tornus ; a brown spot at upper angle of cell ; a fine oblique black postmedial line between vein 5 and submedian fold, with black striga before it below vein 2 ; a slightly sinuous white line just before termen from apex to submedian fold ; cilia orange at base, with black medial line and white tips.

*Hab.* BOLIVIA, Yungas la Paz, 2 ♂ type. *Exp.* 26 mm.



- (11) *Lineodes integra*, Zell. Verh. zool.-bot. Ges. Wien, xxiii. p. 328, pl. iv. fig. 44 (1873).

*Hab.* U.S.A., Texas, Florida ; CUBA ; GRENADA.

- (12) *Lineodes interrupta*, Zell. Verh. zool.-bot. Ges. Wien, xxiii. p. 329 (1873).

*Hab.* U.S.A., Texas.

- (13) *Lineodes contortalis*, Guen. Delt. & Pyr. p. 236 (1854).

*Hab.* MEXICO ; S. BRAZIL ; ARGENTINA.

- (14) *Lineodes mesodonta*, sp. n.

*Scoptonoma tipuloides*, Wlsm. P. Z. S. 1891, p. 393 (part.).

Head and thorax purplish rufous mixed with some whitish and black ; palpi with minute black streak at base of second joint and the extremity of second joint and the third joint blackish ; frons whitish, with fuscous patch at middle ; tarsi whitish ; abdomen ochreous brown, with slight lateral black points on medial segments. Fore wing whitish suffused with red-brown ; whitish streaks below base of costa and cell ; a very oblique whitish antemedial bar defined at sides by black from submedian fold to inner margin ; a triangular whitish mark in end of cell defined above by black, which forms an oblique black-defined tooth on discocellulars ; a very oblique white mark from below end of cell to above inner margin, its upper extremity acutely angled outwards, defined by black on inner side and with a fine black line near its outer edge ; subterminal line black, defined on each side by white to vein 4, then slightly by white on outer side, acutely angled outwards below apex, then incurved, excurved at middle and at submedian fold retracted upwards to the discoidal tooth, a patch of black suffusion beyond it, with white streaks on veins 7, 6 before the white line before termen, defined on outer side by blackish, at discal fold expanding on inner side into a spot, and excurved at middle ; cilia white, chequered with black at apex, middle, and tornus. Hind wing semihyaline white, a black terminal line defined on inner side by white, with some brownish suffusion before it from apex to vein 2 ; cilia white, ochreous at base, and with black medial line to vein 2 ; the underside with the costa suffused with brown, a black streak in upper part of cell.

*Hab.* COLOMBIA (*Petersen*), 4 ♂, 1 ♀ type. *Exp.* 20-22 mm.

(15) *Lineodes aztecalis*, sp. n.

*Lineodes contortalis*, Druce, Biol. Centr.-Am., Het. ii. p. 264 (nec Guen.).

♀. Head, thorax, and abdomen pale brown; palpi blackish towards tips; sides of frons blackish; abdomen with small dorsal blackish spot at base. Fore wing pale greyish brown; an oblique medial black shade defined at sides by fine black lines from cell to inner margin; a discoidal spot slightly defined at sides by blackish, angled inwards above on subcostal nervure, a black point above it on costa; subterminal line black defined on outer side by whitish to vein 4, very acutely angled outwards below apex, then incurved, below vein 4 indistinct, oblique and sinuous to just above inner margin, then retracted upwards to the discoidal spot; a white line defined on each side by blackish suffusion before termen, between veins 6 and 4 strongly bidentate inwards, forming a rather diffused W-mark, incurved below vein 3 and ending on termen above tornus; cilia ochreous at base, with black medial line, the tips white chequered with black. Hind wing semihyaline whitish; a black terminal line defined on inner side by white, with brown suffusion before it towards costa; cilia ochreous at base, with black medial line and white tips slightly mixed with blackish; the underside with the costa brownish irrorated with black, a blackish spot at upper angle of cell.

*Hab.* MEXICO, Jalapa (*Trujillo*), 1 ♀ type, Godman-Salvin Coll. *Exp.* 26 mm.

(16) *Lineodes subextincta*, Wlsm. Faun. Hawaii, i. p. 470, pl. x. fig. 2 (1907).

*Hab.* HAWAII.

(17) *Lineodes ochrea*, Wlsm. Faun. Hawaii, i. pp. 469, 731, pl. x. fig. 1 (1907).

*Hab.* HAWAII.

(18) *Lineodes fontella*, sp. n., Wlsm.

*Lineodes contortalis*, Hmps. P. Z. S. 1899, p. 284; Dyar, N. Am. Lep. p. 394 (nec Guen.).

Antennæ whitish ochreous. Palpi whitish ochraceous, with a brownish fuscous streak along their upper sides. Head whitish ochreous, with a fuscous spot above. Thorax whitish ochreous, tinged anteriorly with fawn-brown. Fore

wings whitish ochreous, partially suffused with fawn-brown, blending to dark brownish fuscous in the more conspicuous markings, and becoming almost black in narrow lines along their edges; there are five small dark fuscous spots on the costa—one near the base, one at one-third, and a group of three on the outer third; the more conspicuous markings consist of an outwardly oblique band arising from the dorsum before the middle, nearly fading out below the costa, but thence angulate outward and tapering obliquely downward to an acute apex, pointing toward the middle of the termen—this mark is narrowly and distinctly outlined with blackish, except on the side facing the costa; between this and the termen is a curiously straggling narrow dark line, set in a pale intermission among the general brownish suffusion; commencing on the costa, at about one-seventh from the apex, this line runs very obliquely outward nearly to the apex, where it is acutely angulate—it then forms a more obtuse angle below its point of origin, whence it is continued nearly to the middle of the termen, angulate again and continued to above and before the tornus, abruptly twisted backward nearly to the projecting point of the great median shade, and again abruptly twisted and sinuate, reaching nearly to the dorsum beyond the middle, a dark brown patch lying a little beyond its inner extremity; the termen is marked throughout by a line of the whitish ground-colour, succeeded by a dark brownish fuscous line, again by a pale fawn-brown line in the basal half of the whitish ochreous cilia—all these angulate outward at the middle of the termen and ending in a dark spot at the extreme apex, from which a dark streak is continued inward and downward, terminating abruptly before reaching the zigzag line. *Exp. al.* 16–17 mm. Hind wings and cilia pale greyish ochreous, a slight fuscous submarginal suffusion toward the apex, with one or two transverse dark lines below the end of the cell, a dark line also along the base of the cilia. Abdomen whitish ochreous, a dark fawn band across its basal half. Legs whitish ochreous, with minute darker spots above at the ends of the tarsal joints.

Type ♀ (97212, *Jamaica*) Mus. Wlsm., B.M.

*Hab.* AMERICA, N-I-S. UNITED STATES—Florida: 1846 (*E. Doubleday*); Miami, 1897 (*W. Schaus*). WEST INDIES—Jamaica: St. Andrew: Constant Springs, 29. XII. 1904 (*Wlsm.*); Newcastle, 1898. SOUTH AMERICA—British Guiana, Rockstone, 25. IV.–9. V. (*W. J. Kaye*); Brazil, São Paulo, 1889 (*E. D. Jones*). Eight specimens.



(19) *Lineodes undulata*, sp. n., Wlsm.

Antennæ pale cinereous, faintly barred with fuscous. Palpi cinereous. Head and thorax pale cinereous. Fore wings pale cinereous, with whitish markings—slightly visible on the underside; at about one-third from the base is a very faintly indicated oblique whitish streak, nearer to the base on the dorsum than on the costa; about the middle of the wing is a rather wide whitish fascia, reaching nearly to the costa, but tending slightly outward above the middle of the wing; the central portion of this fascia is shaded with pale cinereous, and its inner margin is more clearly defined than its outer—both are sinuate; toward the apex of the wing is a curved white streak, with a dark cinereous line along its middle; this streak is clearly defined above, but is only faintly traceable below the middle of the wing—leaving the costa immediately below the apex, its direction tends downward toward the tornus; beyond this, but connected with it on the costa, is a slender undulating white line passing along the termen to the tornus; this is also more clearly defined above than below the middle of the wing—about the middle of the termen one of the undulations of this line forms a slight inverted angle; two or three dark spots occur on the outer half of the costa, and one or two near the base; cilia pale cinereous, with a fuscous line near the base. *Exp. al.* 16–21 mm. Hind wings pale fuscous, without markings; cilia pale cinereous, with a fuscous line near their base. Abdomen whitish at the base, thence cinereous, the fringes at the edges of the segments somewhat darker; anal claspers of ♂ very long, pale cinereous. Legs pale cinereous.

Type, ♂ (3264); ♀ (3093) Mus. Wlsm., B.M.

*Hab.* PERU, Callao, 28. I. 1882 (21. III.–31. VIII.) 1881, 5. XI. 1883 (*J. J. Walker*). Three specimens.

The median fascia is much straighter in *undulata* than in *integra* Z., *interrupta* Z., or *tipuloides* Wlsm. Commander Walker, to whom I am indebted for this species, notes that it was "taken flying at sunset in a weedy field."

(20) *Lineodes cyclophora*, sp. n.

*Lineodes serpulalis*, Druce, Biol. Centr.-Am., Het. ii. p. 265 (nec Led.).

Head, thorax, and abdomen red-brown; palpi with blackish streaks at sides; frons whitish, with blackish spot at middle; antennæ with whitish and brown rings towards base; hind tibiæ towards extremity and the tarsi whitish; abdomen with lateral black spots on medial segments. Fore wing red-brown slightly irrorated with blackish; a fine, oblique, waved, antemedial brown line defined on inner side



by whitish from cell to inner margin ; a whitish patch from middle of costa to median nervure, enclosing an elliptical brown spot, and with a whitish band from it to inner margin, with its sides excised at middle ; a small postmedial whitish spot on costa and slight marks towards apex ; subterminal line black, defined on each side by white to discal fold, then slightly by white on outer side only, acutely angled outwards below apex, then incurved, slightly excurved below vein 4, and ending above tornus, a blackish streak before it in discal fold and some reddish beyond it at tornus ; a fine minutely waved white line slightly defined on each side by black before termen. Hind wing whitish suffused with brown, especially in end of cell and on terminal area to submedian fold ; a fine slightly sinuous whitish line before termen from apex to submedian fold ; cilia white with a blackish line through them ; the underside whiter, the costal area irrorated with blackish, the brown spot in end of cell more distinct, a whitish subterminal line slightly defined on each side by brown lines from costa to vein 2.

*Hab.* MEXICO, Presidio (*Forrer*), 1 ♂ type ; BAHAMAS, Nassau (*Sir G. Carter, Bonhote*), 2 ♀. *Exp.* 20 mm.

(21) *Lineodes serpulalis*, Led. Wien. ent. Mon. 1863, p. 417, pl. xv. fig. 8.

*Lineodes peridialis*, Wlk. xix. 948 (1859).

*Hab.* PERU ; S. BRAZIL ; PARAGUAY.

(22) *Lineodes polychroalis*, sp. n.

♂. Head and thorax purplish red-brown, the metathorax with slight whitish streak ; fore coxæ and fore and mid tibiæ suffused with blackish, the tarsi whitish ; abdomen purplish red, a dorsal whitish streak on three basal segments, the medial segments blackish at sides, the anal tuft reddish ochreous. Fore wing purplish red, extending below the costa to well beyond middle and on inner area to tornus, the rest of terminal area yellow with diffused red streaks on the veins ; some diffused black on antemedial area from costa to median nervure and an oblique black line from the cell to inner margin, with a black streak beyond it in submedian fold ; a white point in middle of cell and a semihyaline white bar defined by blackish across the cell towards its extremity, an obliquely incurved white mark from the bar to vein 1, with a triangular black patch irrorated with white before it and some black beyond it ; a whitish fascia in discal fold beyond the cell and some whitish on postmedial part of costa ; an orange-yellow streak below terminal part of

vein 2; a terminal series of white striæ; cilia purplish red at base, then white, and with black tips. Hind wing semi-hyaline white; the apex with some brownish streaks below it; a small wedge-shaped yellow and purplish-red patch below extremity of vein 2; the termen with fine reddish-brown line in places; the underside with the costal area blackish towards base, purplish red towards apex.

*Hab.* S. PERU, Uruhuasi (*Watkins*), 1 ♂ type. *Exp.* 34 mm.

## AUCTORUM.

<i>Lineodes pulchralis</i> , Guen. Delt. & Pyr. p. 235 (1854) ..	S. Brazil.
„ <i>gracillalis</i> , Herr.-Schäff. Verh. Corresp.-Blatt. Regensb. xxv. p. 22 (1868) .....	Cuba.
„ <i>multisignalis</i> , Herr.-Schäff. Verh. Corresp.-Blatt. Regensb. xxv. p. 22 (1868) .....	Cuba.
„ <i>triangulalis</i> , Möschl. Abh. Senck. Ges. xvi. p. 305 (1890) .....	Porto Rico.
„ <i>metagrammalis</i> , Möschl. Abh. Senck. Ges. xvi. p. 305 (1890) .....	Porto Rico.
„ <i>albicinata</i> , Hering, Stett. ent. Zeit. lxvii. p. 151 (1906) .....	Brazil.
„ <i>furcillata</i> , Hering, Stett. ent. Zeit. lxvii. p. 150 (1906) .....	Bolivia.
„ <i>pulcherrima</i> , Hering, Stett. ent. Zeit. lxvii. p. 155 (1906) .....	Peru.

## GENUS PALÆODES, nov.

Proboscis well developed; palpi porrect, the second joint extending twice the length of head and fringed with hair above and below, the third well developed, naked, acuminate; maxillary palpi strongly dilated with scales; frons rounded; antennæ of male shorter than fore wing, serrate and strongly ciliated; legs long and slender, the spurs long and even. Fore wing long and narrow, the apex produced and acute, the termen excised below apex; veins 3 and 5 from close to angle of cell; 6 from below upper angle; 7, 8, 9 from angle; 10 from near angle; 11 free. Hind wing with veins 3, 4 from angle of cell; 5 from middle of discocellulars; 6, 7 from upper angle, 7 anastomosing shortly with 8; the apex produced; the termen sinuous, excurved at middle.

\**Palæodes samealis*, sp. n.

♂. White; head, thorax, and abdomen strongly irrorated with brown; palpi brown except at base; fore legs fuscous, the tarsi ringed with brown. Fore wing strongly irrorated with brown; the basal area suffused with brown; some blackish marks on costa; an elliptical brown spot in middle

of cell, with an obscure band from it to inner margin; a dark-edged brown discoidal spot on a diffused brown band; a diffused terminal band from costa to above tornus. Hind wing irrorated with brown; an antemedial series of three points; a dark-edged discoidal brown spot with dark band from it to tornus; a diffused dark apical patch and some points on termen.

*Hab.* QUEENSLAND (*Barnard*). *Exp.* 16 mm. Type in Coll. Rothschild.

## PROCEEDINGS OF LEARNED SOCIETIES.

### GEOLOGICAL SOCIETY.

April 23rd, 1913.—Dr. Aubrey Strahan, F.R.S., President, in the Chair.

The following communications were read:—

1. 'On the Fossil Flora of the Pembrokeshire Portion of the South Wales Coalfield.' By Reginald H. Goode, B.A.

Of the fifty-three determinable species of fossil plants obtained from the Pembrokeshire portion of the South Wales Coalfield, three are new species. One may be referred to *Linopteris browniarti* Gutb., a plant which has not with certainty been found before in Britain.

From the palaeobotanical evidence it is clear that the so-called 'Pennant Grit' of Pembrokeshire cannot be regarded as the equivalent of the Pennant Grit of the main portion of the South Wales Coalfield: for the plants indicate that these beds are Middle Coal Measures, and do not belong to the Transition Series. The Lower Coal Series also clearly belongs to the Middle Coal Measures; and the Settling Beds, and perhaps the Falling Cliff Beds as well, lie probably at a higher horizon than the Lower Coal Series as developed farther east along the Saundersfoot coast, and even possibly higher than the Timber Vein group.

Until more plants have been obtained from the so-called 'Millstone Grit' of Pembrokeshire, it is impossible to fix definitely the horizon of these beds from the palaeobotanical evidence. However, from the fossil plants obtained in the so-called 'Millstone Grit' of Monkstone Point, and in neighbouring beds belonging to the Lower Coal Series, between which there is no apparent unconformity, it is evident that these particular beds, assigned to the Millstone Grit, probably belong to the Middle Coal Measures.

When the fossil plants which have been obtained from the Pembrokeshire Coalfield are compared with those which have been recorded from the main South Wales Coalfield, it is evident that there are considerable differences in the occurrence of the species.

Thirty-two fossil plants have been obtained from the Middle Coal Measures of Pembrokeshire which have not as yet been



recorded from those of the main South Wales Coalfield, and hence are additions to our knowledge of the flora of the Middle Coal Measures of South Wales.

2. 'The Halesowen Sandstone Series of the Southern End of the South Staffordshire Coalfield; and the Petrified Logs of Wood found therein at Witley Colliery, Halesowen (Worcestershire).' By Henry Kay, F.G.S. With an Appendix on the Structure of a New Species of *Dadoxylon*, by E. A. Newell Arber, M.A., Sc.D., F.L.S., F.G.S.

The Halesowen Sandstones are separable from the Old Hill Marls by a series of passage-beds consisting of conglomerate-bands, marl-bands, and ironshot sandstones.

At the summit of the series is Prof. Charles Lapworth's '*Spirorbis* Limestone Group,' which is re-named the 'Illey Group,' in consequence of the discovery of *Spirorbis* limestone at other horizons.

The Halesowen coal-seam and associated beds of blue clay form a definite intermediate horizon traceable across the coalfield. On this is based a classification consisting of:—

	Thickness in feet.
(5) The Illey Group .....	100 to 120
(4) The Hasbury Group .....	120 to 150
(3) The Halesowen Coal and Clays.....	10 to 50
(2) The Witley Group .....	200
(1) The Passage Beds .....	0 to 100

The area is folded into two anticlines with a deep central syncline ranging south-south-eastwards, and the strata have a persistent south-south-easterly dip. The northern face is let down by a fault repeating the lower beds. Other faults throw southwards, and yet others intersect the anticlines. Unconformities occur at the base and at the summit of the Hasbury Group in the Wassel Grove area, the former being largely buried by horizontal members of the group. Mining operations show the existence of a buried anticline with the full Coal-Measure Series, but cutting out successively the Old Hill Marls, the Passage Beds, and a great part of the Witley Group. This is cut off by a fault only from the exposed Netherton Anticline immediately on the north, the uprise of which in early Upper Carboniferous time is therefore inferred.

The Keele Beds rest unconformably near the buried anticline upon the Illey Group, and upon various members of the Hasbury Group, and are themselves much reduced in thickness. Additional uplift of the anticline in later Upper Carboniferous time is suggested as the cause.

The Witley Colliery railway-cutting shows big logs of petrified wood very finely preserved by calcite, and indisputably of Upper Carboniferous age. The wood has been examined by Dr. Newell Arber, who finds it to have Araucarian affinities, but of a species new to science. In consequence of its Palæozoic age, it is referred to the genus *Dadoxylon*. The type of preservation is also new to this horizon in this country, and the discovery of *Dadoxylon* at Witley constitutes a new record for British Upper Carboniferous rocks. Among the associated plants are *Calamites*, *Lepidodendron*, etc.



## THE ANNALS

AND

## MAGAZINE OF NATURAL HISTORY.

[EIGHTH SERIES.]

No. 70. OCTOBER 1913.

XXXIX.—*Descriptions of new Species of Staphylinidæ from the West Indies.* By MALCOLM CAMERON, M.B., R.N., F.E.S.

## PART I.

## LISPINI.

1. *Lispinus claviger*, sp. n.(Fauvel, *in litt.*)

Black, shining; thorax and elytra red; antennæ and legs, posterior margins of first four visible abdominal segments narrowly, the penultimate broadly, and the last entirely reddish testaceous.

Length 2 mm.

Size of *L. nigrifrons*, Fvl., but the much less depressed form, more shining, differently coloured, distinctly but sparingly punctured thorax, and the very slight ground-sculpture of the fore parts readily distinguish it.

Head black, slightly rufescent in front, with a well-marked fovea on either side between the eyes, feebly and sparingly punctured, with a fine transverse strigose ground-sculpture and a few fine setæ. Antennæ pilose, with the first three joints gradually decreasing in length; fourth and fifth about as long as broad; sixth small, transverse; seventh to tenth much more strongly transverse; eleventh short, oval. Thorax distinctly transverse, as wide as the elytra, the sides slightly rounded in front, the basal third narrowed in a

straight line to the posterior angles, which are obtuse, impressed on either side before the base; puncturation rather large, sparing, and scattered; ground-sculpture strigose, feeble. Elytra longer than the thorax, a little longer than broad, parallel, with distinct sutural stria, internal to which is a row of four or five punctures and externally two setigerous pores; the disc with a very few, very fine obsolete punctures and scarcely perceptible ground-sculpture. Scutellum transversely strigose, with a few marginal punctures. Abdomen with sparing, more or less erect, yellow pubescence and distinct ground-sculpture forming a scaly pattern.

St. Vincent (*H. H. Smith*). Type in the British Museum.

## 2. *Lispinus impar*, sp. n.

(Fauvel, *in litt.*)

Entirely red; head sometimes darker, shining, sparingly punctured; ground-sculpture rather feeble. Antennæ and legs reddish testaceous.

Length 2.5–2.8 mm.

In size and general appearance similar to *L. fauveli*, Shp., especially to the immature reddish forms. The thorax is, however, a little shorter, more abruptly narrowed before the posterior angles; the ground-sculpture is much less distinct throughout, and on the thorax forms longitudinal meshes.

Head large, a little narrower than the thorax, foveolate in front on either side, finely and sparingly punctured; ground-sculpture coriaceous. Antennæ with first joint rather stout, a little longer than second; third, fourth, and fifth longer than broad and scarcely differing in length; sixth to tenth transverse, gradually increasing in width, pilose. Thorax distinctly transverse, about one and a half times as broad as long, broadest in front of the middle, gradually narrowed anteriorly, rather abruptly narrowed at the base before the slightly obtuse posterior angles; disc with smooth impunctate central line, longitudinally impressed on either side, the impression reaching from within the posterior angles forwards for fully half the length, finely and sparingly punctured on the disc, almost impunctate at the sides, with a fine longitudinal strigose ground-sculpture; sides with four or five setæ. Scutellum impunctate. Elytra more than half as long again as the thorax, distinctly longer than broad, sides with two or three setæ; pretty deeply impressed at the base internal to the humeral angles, and with two setigerous pores, one near the suture posteriorly and one in front and external; puncturation very fine and very sparing; ground-

sculpture longitudinally strigose. Abdomen with very few punctures, pubescence more or less erect, sparing; ground-sculpture distinct, reticulate.

St. Vincent (*H. H. Smith*). Type in the British Museum.

### THORACOPHORI.

#### 3. *Thoracophorus guadalupensis*, sp. n.

(Fauvel, *in litt.*)

Very small, narrow, dull, reddish brown, with head darker. Antennæ and legs reddish testaceous.

Length 1.8 mm.

In general appearance and form of thorax very near *T. pallidas*, Shp., but differs in the darker colour, more robust build, and shorter elytra.

Head pitchy black, suborbicular, with four longitudinal carinæ; eyes small, visible from above; temples very small, angular. Antennæ reddish testaceous; first and second joints dilated, of about equal length; third much narrower than the second, but of equal length; fourth to sixth of equal length and breadth, as long as broad; seventh larger than the sixth, as long as broad; eighth to tenth transverse; eleventh shortly oval. Thorax transverse, quite a third broader than long, broader between the anterior than the posterior angles; sides gradually converging posteriorly, finely crenulate, emarginate before the rectangular posterior angles; anterior angles almost rectangular; disc with four distinct longitudinal carinæ, the two central bounding on each side a median elevated part (which shows traces of two short parallel carinulæ), the two lateral close to and nearly parallel with the sides. Elytra nearly a third longer than the thorax, a little transverse, each with five longitudinal carinæ, the intervals concave. Sculpture of all the fore parts coriaceous. Abdomen gradually pointed, finely coriaceous, very finely and sparingly punctured and pubescent.

Grenada (*H. H. Smith*); Haiti. Type in the British Museum.

### OXYTELI.

#### 4. *Trogophlæus (Carpalimus) smithi*, sp. n.

(Fauvel, *in litt.*)

Black, shining: thorax cordate, with semilunar impression before the base and a small impression on either side of the

disc. First joint of antennæ and legs yellow; elytra dark brown.

Length 3 mm.

Very near *T. centralis*, Shp., from which it differs by the finer and uniform puncturation of the thorax and the finer puncturation of the elytra. From *T. croceipes*, Fvl., it differs by the much narrower head and thorax, much more coarsely punctured and more even elytra, and the yellow legs and first antennal joint.

Head rather large, narrower than the thorax; eyes large, their diameter greater than the length of the temples; longitudinally impressed on either side in front, closely and distinctly punctured. Antennæ with exception of the first joint dark; the second a little shorter than third; third to eighth longer than broad, gradually decreasing in length; ninth and tenth about as long as broad; eleventh oval, pointed. Maxillary palpi brown. Thorax transverse, cordate, narrower than the elytra, dilated and rounded in front and narrowed behind; anterior angles completely effaced; disc with a distinct fovea on either side of the middle line and a semilunar impression before the base; puncturation as on head, uniform. Elytra quite one-third longer than the thorax, as long as broad, with an oblique impression between the shoulder and suture; puncturation as of thorax, evanescent towards the postero-external angles. Abdomen finely and rather closely punctured and pubescent.

Grenada (*H. H. Smith*). Type in the British Museum.

## THINOBII.

### 5. *Thinobius miricornis*, sp. n.

(Fauvel, *in litt.*)

Pitch-black or pitch-brown; the thorax, base of abdomen, legs, first and last three joints of antennæ yellow, sometimes the latter entirely yellow.

Length 1.3 mm.

Head narrower than the thorax, transverse, with transverse impressed line between the antennal tubercles; eyes rather small, their diameter about equalling the length of the temples; sculpture close, rugulose. Antennæ (♂) more elongate than in ♀; first joint stout, second shorter than third, fourth to tenth much longer than broad, eleventh a little longer than tenth; in ♀ fourth to sixth joints about twice as long as broad, seventh and eighth a little longer than broad, ninth and tenth as broad as long, eleventh



elongate, nearly as long as the two preceding together. Mouth-parts yellow. Thorax strongly transverse, more than half as broad again as long, almost semicircular, widest in front; sides evenly rounded from base to anterior angles, which are slightly obtuse, posterior angles effaced; disc rather broadly and deeply impressed in its whole length in middle line in ♂, less distinctly or not at all in ♀. Sculpture as on the head. Scutellum yellow. Elytra broader than the thorax and twice its length, scarcely broader than long, with fine rugulose sculpture. Abdomen closely and finely punctured and pubescent, a little more sparingly behind.

St. Vincent, Grenada (*H. H. Smith*). Type in British Museum.

## OSORII.

### 6. *Holotrochus smithi*, sp. n.

(Fauvel, *in litt.*)

Black, shining; posterior margins of abdominal segments, legs, and antennæ reddish testaceous; margins of thorax and elytra sometimes obscurely red.

Length 3.3–3.5 mm.

Very similar to *H. marginatus*, Shp., in size and general appearance; but distinguished from it by the longer thorax, not bordered at the base, the fine but distinct reticulate ground-sculpture, and the finer and more obsolete puncturation of the head and thorax, and the impunctate shagreened scutellum. From *H. minor*, Fvl., it differs by its larger size, the ground-sculpture, and much finer and more obsolete puncturation of the head and thorax, and impunctate shagreened scutellum; and from *H. cylindrus*, Er., by its shorter and broader thorax and elytra, more distinct ground-sculpture of both the latter, and the impunctate shagreened scutellum.

Head narrower than the thorax, truncate anteriorly, very finely and very sparingly punctured, with a fine reticulate ground-sculpture. Antennæ with the first joint stout, second as long as, but stouter than third, fourth and fifth globose; fifth slightly, sixth to tenth more strongly transverse. Thorax about a third broader than long, a little wider at the anterior angles, very gradually and slightly narrowed behind. Sculpture as on head. Elytra as long as, but narrower than, the thorax, transverse, without visible puncturation, but obsoletely shagreened. Abdomen impunctate, shagreened.

St. Vincent (*H. H. Smith*). Type in the British Museum.

7. *Osorius fauveli*, sp. n.

Black, shining; elytra red; antennæ, legs, and posterior margins of the abdominal segments narrowly reddish testaceous. Head, thorax, and elytra moderately coarsely, but not very closely, punctured. Abdomen with sparse superficial puncturation.

Length 3 mm.

From the description should be placed near *O. eggersi*, Bernh., from which it differs in colour, absence of impunctate space on the head, the transverse thorax deeply foveolate in front of the posterior angles, the elytra longer than the thorax, and the sparing superficial puncturation of the abdomen.

Head narrower than the thorax, truncate in front, with scattered umbilicate puncturation and coriaceous ground-sculpture, without a smooth central line. Antennæ with fourth to tenth joints transverse, gradually increasing in breadth; mouth-parts yellow. Thorax a little broader than the elytra, a little broader than long; sides almost parallel for four-fifths of their length, then suddenly contracted to the nearly rectangular posterior angles, with a deep rounded fovea in front of the latter, and with rather large, scattered, superficial, umbilicate puncturation, and with a smooth central line; ground-sculpture distinct, coriaceous; pubescence rather long, coarse, and sparing. Elytra a little longer than the thorax, as long as broad, with puncturation, ground-sculpture, and pubescence similar to that of the thorax. Abdomen with very sparing and still more superficial puncturation, and similar ground-sculpture to the elytra; pubescence long, coarse, and sparing.

Haiti. Type in my collection.

## MEGALOPINI.

8. *Megalops leviventris*, sp. n.

(Fauvel, *in litt.*)

Black, shining; thorax with four more or less transverse grooves on either side; each elytron with well-marked humeral callus, behind and internal to which is an impression bearing three to five large punctures grouped irregularly; between the impression and the suture a rounded elevation or callus, and between the impression and the posterior margin a small puncture. Legs and antennæ

reddish testaceous, the club of the latter infusate; fourth tarsal joint simple.

Length 3.5–4 mm.

About the size of *M. incultus*, Shp., but very different by the much smaller head and eyes, less strongly grooved thorax, and the punctured impression on the elytra.

Head, with eyes, large, transverse, almost as broad as the elytra; clypeal spines short, not very distinct; front entirely occupied by a horseshoe-shaped impression, concave backwards, the bottom coarsely and deeply punctured, the smooth space enclosed by it carrying a curved row of three punctures, concave forwards; vertex with a fine, short, raised line in the middle; mandibles red. Antennae reddish testaceous, the last two joints brown; first joint concealed, second moderately long and stout, third considerably longer than second and much more slender, fourth to sixth each a little longer than broad, seventh as broad as long; eighth to tenth transverse, the last of them much broader than the ninth; eleventh oval, pointed. Thorax widest at the middle, its sides evenly rounded, about as long as broad, marked with four more or less transverse furrows on each side; the first, impunctate, follows the anterior margin, disappearing on the disc; the second is deeper, with three large punctures on either side and one on middle of the disc; the third, also deep and punctured, does not extend across the disc, but is bounded by a large deep puncture on either side of the middle line; the fourth is narrow, follows the posterior border of the thorax, is not interrupted, and is obscurely punctured. Elytra as long as, but broader than, the thorax, transverse; humeral callus well marked, as is also another boss or callus at the base near the suture, base depressed between the calli and with one or two small punctures. External to the sutural callus is an impression containing a group of three to five large punctures, and between this and the posterior margin is a small puncture. Sutural stria distinct, impunctate. Abdomen impunctate, each segment except the last with a short narrow impression at the base on each side.

No sexual differences observed.

Grenada (*H. H. Smith*). Type in British Museum.

### 9. *Megalops humeralis*, sp. n.

(Fauvel, *in litt.*)

Black, shining; elytra yellow, with humeral callus, base, and apex narrowly black; disc with short, deep, punctured

stria. Legs and antennæ (except last two joints, which are fuscous) reddish testaceous. Tarsi simple.

Length 4 mm.

Narrower and less robust than the smallest specimens of *M. punctatus*, Er., and the elytra nearly entirely testaceous.

Head and antennæ much as in the preceding species; thorax a little longer than broad, a little wider in the middle, equally narrowed in front and behind, with the sides evenly rounded, narrower than the head and the elytra, and with four coarsely punctured transverse impressions on each side, the first separated from each other by a narrow smooth space on middle of the disc; the second are separated by a broader space bearing a large puncture, the third by a wider impunctate space, the fourth follow the posterior margin and are not interrupted. Elytra about as long as the thorax, scarcely transverse, testaceous; the humeral callus and base narrowly black, the apical margin narrowly and irregularly blackish; sutural callus, sutural stria, and short punctate stria on the disc well marked. Abdomen as in preceding.

St. Vincent (*H. H. Smith*). Type in the British Museum.

#### 10. *Megalops smithi*, sp. n.

(Fauvel, *in litt.*)

Blue-black, shining; elytra lemon-yellow, with humeral callus; base, suture, sides, and apical margins narrowly reddish brown, without trace of impression or striæ on the disc. Legs and antennæ (except last two joints, which are brown) reddish testaceous. Tarsi simple.

Length 3.5 mm.

Head with eyes broader than the elytra; clypeal spines long, brownish; mandibles reddish. Antennæ much longer than in the preceding; first joint concealed, second twice as long as broad, third twice as long as second, fourth to eighth longer than broad, gradually decreasing in length; ninth and tenth transverse, especially the tenth; eleventh oval, pointed; front with circular punctate impression, enclosing a smooth, round, central, raised space; vertex with narrow longitudinal raised line. Thorax (viewed from above) nearly cylindrical, with a small blunt tooth on each side behind the second furrow, a little longer than broad, with four transverse punctured furrows; the first, not interrupted in the middle line, follows the anterior margin; the second is very narrowly interrupted by a feeble longitudinal ridge; third distinctly interrupted by a smooth space; fourth follows the posterior margin and is not interrupted. Elytra



broader than the thorax, widest in the middle, scarcely as long as the thorax, transverse; humeral callus well marked, sutural callus absent, sutural stria distinct; no trace of discal stria or impression; lemon-yellow, with humeral callus, base, suture, and apical margins narrowly reddish brown, the lateral margins very narrowly reddish. Abdomen impunctate.

St. Vincent (*H. H. Smith*). Type in the British Museum.

#### STENINI.

#### 11. *Stenus* (*Mesostenus*) *lucens*, sp. n.

(*croceipes*, Fv1., in litt.).

Narrow, elongate, shining black; elytra and abdomen very sparingly punctured. Antennæ and legs reddish testaceous, the club of the former infusate.

Length 3.5 mm.

This species, by its very smooth polished surface, recalls the genus *Megalops*.

Head, with eyes, broader than the elytra, with rather broad, raised, almost impunctate, central space; the rest of the surface with moderately large, not very close puncturation; the central space and the surface between the punctures smooth and polished without trace of ground-sculpture, glabrous; labrum black. Antennæ rather long and slender, second joint shorter than the first, third much more slender than the second and nearly double its length, fourth a little shorter than third, fifth as long as fourth, sixth a little shorter than fifth, seventh a little shorter than sixth; eighth about half the length of seventh, longer than broad; ninth and tenth of equal length, as long as, but stouter than, seventh; eleventh oval, pointed. Thorax widest at the middle, scarcely longer than its greatest width, equally narrowed in front and behind, impressed on either side at the widest part; puncturation much finer and more sparing than on the head, the interspaces smooth and polished, glabrous. Fourth tarsal joints deeply bilobed, the hind tarsi long and slender. Scutellum triangular with large puncture at apex, coriaceous. Elytra shorter than the thorax, transverse, with distinct humeral callus and an impression internal to the latter; disc impressed, puncturation fine and scattered as on thorax, interspaces smooth, polished, glabrous. Abdomen margined, gradually narrowed to the apex, with a few scattered punctures at the bases of the segments; the rest of the surface almost impunctate, pubescence scanty.

♂. Eighth dorsal plate with horseshoe-shaped emargination, fourth and fifth ventral plates impressed in the middle, sixth ventral plate with a narrow, rather deep, triangular excision.

Grenada (*H. H. Smith*). Type in the British Museum.

#### PINOPHILI.

##### 12. *Pinophilus vermiformis*, sp. n.

(Fauvel, *in litt.*)

Head and elytra reddish brown; thorax and abdomen pitchy brown, the posterior margins of the segments and apex of the latter reddish. Antennæ, mouth-parts, and legs pale yellow.

Length 6.5 mm.

Of about the size and build of *P. debilis*, Shp., but easily distinguished by being less shining and more pubescent, with shorter thorax, more sparingly punctured head, much more coarsely and sparingly punctured abdomen, and with red elytra.

Head large, transverse, with the eyes nearly as broad as the thorax at the anterior angles; eyes large, temples scarcely visible; front with an obsolete puncture on each side of the middle line behind the labrum; a row of four or five moderately large punctures on each side, converging towards the vertex, and two or three more or less obsolete punctures above and behind the eyes; no visible ground-sculpture. Antennæ filiform, pilose; first and second joints stout, elongate; second shorter and not so thick as first; third to seventh distinctly longer than broad, club-shaped; eighth and ninth a little longer than broad; tenth and eleventh moniliform. Thorax a little broader than long, a little wider at the anterior angles, narrowed in a straight line to the posterior angles, which are obtuse; truncate anteriorly with rounded anterior angles; disc with smooth impunctate line; the rest of the surface covered with pretty close, moderately coarse, umbilicate puncturation; pubescence rather long and scanty. Elytra as wide as the thorax at the anterior angles and a third longer, distinctly longer than broad, coarsely and closely punctured, much more closely and coarsely than the thorax; pubescence rather long, scanty. Abdomen gradually but strongly attenuated posteriorly; the first two visible segments pretty closely and moderately coarsely punctured, the following gradually less closely and more finely; pubescence rather long, not thick.

Mustique Island, Grenadines (*H. H. Smith*). Type in British Museum.

## PROCIERI.

13. *Palaminus insularis*, sp. n.

A narrow, delicate, fragile species, shining testaceous; abdomen reddish. Legs and antennæ pale yellow, the last joint of the latter scarcely stouter than the penultimate.

Length 2·8 mm.

Very close in general appearance, size, and colour to *P. fragilis*, Shp., but differs from it by the last joint of the antennæ not being thickened, the puncturation of the head and thorax more sparing, the sides of the latter more uniformly rounded towards the base, and the elytra rather shorter. From *P. pallidus*, Sahlb., it differs by its smaller size, the rounded sides of the thorax, and the less numerous but larger imbrications of abdominal segments; from *P. variabilis*, Er., by its fragile build, the eleventh joint of the antennæ not thickened, and the much less distinct puncturation of the elytra.

Head transverse with the eyes a little wider than the thorax, very sparingly and rather superficially punctured. Antennæ very slender; first and second joints of about equal length, a little thickened; third about as long as, but much more slender than, second; fourth to tenth longer than broad, gradually decreasing in length; eleventh a little longer, but not thicker, than tenth. Thorax transverse, narrower than the elytra; the sides gradually rounded and contracted to the base, widest at the junction of the middle and anterior thirds; disc with a trace posteriorly of an elevated line; puncturation rather coarse, umbilicate, scattered; pubescence rather long and sparing. Elytra double the length of the thorax, distinctly longer than broad, puncturation fine and sparing, obsolescent posteriorly and externally; pubescence rather long, coarse, and sparing. Abdomen with imbricate sculpture on the first four visible segments; pubescence scanty and coarse.

♂. Last ventral plate a little produced and rather abruptly narrowed towards the end.

Jamaica, Hope Gardens district. Type in my collection.

14. *Palaminus coriaceus*, sp. n.

A narrow, fragile, delicate species varying from testaceous to reddish testaceous, not very shining; the head and thorax with very distinct coriaceous ground-sculpture. The last joint of the antennæ distinctly thicker than the penultimate.

Length 2·9 to 3·3 mm.

Very similar to the preceding in build, but at once dis-

tinguished by the ground-sculpture of the head and thorax, the thickened last joint of the antennæ, and the obsolete puncturation of the fore parts.

Head transverse, with the eyes broader than the thorax, sparingly and obsoletely punctured. Antennæ testaceous, of similar structure to the preceding, except for the eleventh joint, which is stouter and longer than the tenth. Thorax formed as in *P. insularis*, puncturation scanty and very obsolete. Elytra as in the preceding species and without visible ground-sculpture. Abdomen reddish with the usual imbricated sculpture and coarse pubescence.

♂. Last ventral plate gradually narrowed and produced. Jamaica, Haiti. Type in my collection.

#### PÆDERINI.

##### 15. *Stilicopsis circumflexus*, sp. n.

(Fauvel, *in litt.*)

Pitchy red, scarcely shining; antennæ, legs, apex of abdomen, and elytra testaceous, the latter with well-marked black lateral spot. Seventh abdominal segment furnished posteriorly with a narrow white membranous border.

Length 2·8 to 3 mm.

*Variety*.—Entirely reddish testaceous with elytral spot ill-defined. Type-form readily recognized by the coloration, but the variety very similar to *S. brevis*, Shp., in general appearance, but differs by the rather narrower head, distinctly narrower thorax, and shorter elytra. Head large, sub-orbicular, as broad as the elytra. Eyes rather large, prominent; temples not quite so long as the diameter of the eyes, slightly convergent to the posterior angles, which are rounded; puncturation close and umbilicate. Labrum produced in a median lobe in front, notched in the middle of the anterior margin, external to the lobe on either side with a short triangular tooth directed forwards and inwards. Antennæ as long as the head and thorax; first joint elongate, rather stout, three times as long as the second; second narrower than the first, a little longer than broad, shorter than third; third to ninth longer than broad, gradually decreasing in length; tenth about as long as broad; eleventh not so long as the two preceding together. Thorax a little transverse, narrower than the head and elytra, widest at the anterior angles which are obtusely rounded, narrowed to the posterior angles which are effaced; sides with two or three setæ; puncturation close and umbilicate. Elytra scarcely



longer, but a little broader, than the thorax, transverse, pretty closely and distinctly punctured. Abdomen rather shining, finely but not densely punctured and pubescent.

♂. Last ventral plate broadly and deeply emarginate, penultimate with broad shallow emargination.

Mustique Island, Grenadines (*H. H. Smith*). Type in the British Museum collection.

#### 16. *Stilicopsis auripilis*, sp. n.

(Fauvel, *in litt.*)

Reddish testaceous; elytra, antennæ, and legs yellow. Seventh dorsal abdominal segment not furnished with a membrane at the posterior border.

Length 2·8 to 3 mm.

Very similar to the paler forms of the preceding with ill-defined elytral spot, and it will be sufficient to indicate the differential characters, which are the absence of a membrane on the seventh dorsal segment and the thicker pubescence of the abdomen.

♂. Characters as in preceding.

Grenada (*H. H. Smith*). Type in the British Museum collection.

#### 17. *Stannoderus bernhaueri*, sp. n.

Reddish testaceous; elytra convex, not widened behind, yellow. Front of head and thorax with rather coarse rugulose sculpture.

Length 4 mm.

Somewhat resembling *S. championi*, Shp., but smaller; the sculpture of the head and thorax more distinct; puncturation of elytra finer and the abdomen more closely and finely punctured and pubescent.

Head large, longer than broad, convex behind, depressed and produced in front of the eyes, which are large and prominent; temples rounded; labrum produced and truncate in the middle; sculpture close, rugulose in front of eyes, obsolete on vertex. Antennæ yellow, long and slender; first joint elongate, stout; second about half as long as first, slender; third about as long as first; fourth to tenth considerably longer than broad, gradually decreasing in length; eleventh as long as, but stouter than, tenth. Thorax narrower than the head, a little longer than broad, flask-shaped, much narrower in front, dilated and rounded at the sides, which are furnished with a long seta, closely and rugosely

sculptured, impressed on either side behind the widest part; disc with a fine median raised line. Elytra as long as the thorax, as broad as the head and a little longer than broad, a little rounded at the sides, pretty closely and moderately finely punctured; pubescence scanty. Abdomen with rather close aciculate puncturation and moderately pubescent.

♂. First joint of posterior tarsi long and thick; sixth ventral plate rather broadly and moderately deeply emarginate; fifth ventral plate with a shallow emargination.

Jamaica (Hope River district). Type in my collection.

18. *Stamnoderus dissimilis*, sp. n.

Entirely reddish testaceous; elytra depressed on the disc, widened behind. Front of head and thorax rather coarsely and rugosely sculptured.

Length 5 mm.

Somewhat resembling *S. gracilis*, Shp., in facies, the elytra being narrow at the shoulders, widened behind, and depressed on the disc. The colour is, however, more reddish; the head broader and much more finely, closely, and distinctly sculptured; the thorax broader and more finely sculptured; the elytra more finely punctured, and the abdomen more closely and finely punctured. From *S. labeo*, Er., it differs by its rather larger and more robust build, much more coarsely sculptured head, broader and more distinctly sculptured thorax with much less distinct lateral impressions, and the more coarsely punctured elytra. From *S. bernhaueri* it differs by the broader thorax with well-marked basal impression and a smooth shining space on either side between this and the lateral impression, by the shape of the elytra, the much finer and scarcely aciculate puncturation of the abdomen, and the much longer second joint of the antennæ.

Head large, convex behind, produced and depressed in front of the eyes, which are large and prominent, posterior angles rounded; closely and rugosely sculptured in front of the level of the eyes, scarcely perceptibly punctured behind; foveolate on either side between the eyes. Antennæ yellow, long, slender; first joint elongate, second much shorter than first, third much longer than second; fourth to seventh of about equal length, much longer than broad; eighth to tenth longer than broad, gradually decreasing in length; eleventh oblong-ovate, longer than tenth. Thorax a little narrower than the head, flask-shaped, rounded and dilated in the middle, strongly narrowed in front, less strongly narrowed behind, distinctly impressed at the base before the scutellum and on

either side just behind the greatest width, finely carinate in the middle line, closely and rugosely sculptured except for a smooth space on either side between the basal and lateral impressions. Elytra a little widened posteriorly, the greatest width equalling that of the thorax, scarcely as long as the latter; shoulders oblique, depressed on the disc, pretty closely and distinctly punctured. Abdomen dirty testaceous, paler at the apex, closely and finely punctured. Legs pale yellow.

Jamaica (Hope River district). A single female.

Type in my collection.

19. *Stannoderus apicalis*, sp. n.

Pale testaceous yellow, shining; base and sides of elytra more or less infuscate; abdomen blackish with yellow apex. Head and thorax scarcely perceptibly sculptured.

Length 2·8 to 3 mm.

A small delicate species, not likely to be confused with any other at present known.

Head large, convex behind, produced and depressed in front of the level of the eyes, which are large and prominent, with a small fovea on either side and a few very obsolete punctures; temples completely rounded. Antennae slender with all the joints longer than broad, second shorter than the first and third. Thorax narrower than the head and elytra, flask-shaped, rounded and dilated at the sides, strongly narrowed in front, less strongly behind, narrowly impressed on either side behind the widest part, sparingly and obsoletely punctured, with trace of median line. Elytra a little longer than the thorax, longer than broad, moderately closely and finely punctured, more obsoletely behind. Abdomen exceedingly finely and rather closely punctured, finely pubescent.

Jamaica (Hope River district). Five females.

Type in my collection.

20. *Stannoderus varians*, sp. n.

(Fauvel, *in litt.*)

Black: apical margin of elytra and apex of abdomen testaceous. Head and thorax closely and rugosely sculptured; elytra moderately coarsely and closely punctured.

Length 3 to 3·5 mm.

Var. *a*. Head and thorax ferruginous.

Var. *b*. Head, thorax, and elytra ferruginous, the latter more or less infuscate at the base and sides.

Var. *c*. Entirely reddish testaceous.

Shape of head as in preceding, foveolate on either side between the eyes, rugulosely sculptured, except posteriorly. Antennæ testaceous, of similar structure to the preceding. Thorax a little narrower than the head and elytra, longer than broad, flask-shaped, impressed on either side behind the widest part; disc with fine smooth carina, the rest of the surface with rugulose umbilicate sculpture. Elytra as long as, or a little longer than, the thorax, as long as broad, moderately coarsely and closely punctured. Abdomen finely and sparingly punctured and pubescent.

♂. First joint of posterior tarsi thickened, sixth ventral plate with a shallow emargination.

Grenada, St. Vincent (*H. H. Smith*). Type in the British Museum.

21. *Echiaster waterhousei*, sp. n.

(Fauvel, *in litt.*)

Ferruginous, dull; elytra testaceous with apical half black.

Length 2.3 mm.

In coloration nearest to *E. filum*, Shp., and *E. curtus*, Shp.: from the first very distinct by the much shorter and broader thorax, and less elongated and attenuated build; from the last by the much narrower and less robust build, smaller head, narrower thorax, with the longitudinal impressions and median elevated line much less distinct, and the finer sculpture.

Head subquadrate, longer than broad, dull, ferruginous, posterior angles rounded; eyes rather large, their diameter less than the length of the temples; puncturation close, rugose, umbilicate. Antennæ testaceous, short; first joint much dilated; second transversely oval; third globose, much smaller than second; fourth to tenth transverse, gradually increasing in breadth, the penultimate about three times as broad as long; eleventh not quite so long as the two preceding together. Thorax narrower than the head and the elytra, longer than broad, oval-oblong, widest at the anterior angles, which are rounded, narrowed in front and behind, with the posterior angles obtuse; disc posteriorly with a longitudinal impression on either side of the middle line, which by contrast appears more or less elevated; sculpture as on head. Legs testaceous. Elytra longer than the thorax, longer than broad, the basal half testaceous, the apical half black, usually sharply defined, but sometimes only represented by a fuscous cloud. Sculpture close, rugose, with short pubescence.



Abdomen gradually narrowed behind, reddish testaceous, a little infusate before the apex; rather closely and coarsely punctured and pubescent at the base, more sparingly posteriorly.

Grenada (*H. H. Smith*). Type in the British Museum.

22. *Echiaster bupthalmus*, sp. n.

Reddish testaceous, dull; elytra yellow with the apical third sharply black; apex of abdomen blackish. Antennæ and legs testaceous.

Length 3 mm.

Differs from the preceding by the larger head, larger eyes, shorter temples, longer narrower thorax, coloration of the elytra, and more pointed abdomen; from *E. filum*, Shp., by the broader head, larger eyes, shorter temples, broader even thorax without central ridge or longitudinal impressions, and longer elytra with only the apical third black.

Head large, nearly orbicular, much wider than the thorax, posterior angles rounded; temples much shorter than the eyes, which are large; puncturation dense, umbilicate. Antennæ short; first joint elongate, stout; second oval, third longer than broad, fourth and fifth about as long as broad, sixth to tenth transverse. Thorax oval-oblong, even, without central ridge or impressions, anterior angles completely rounded, the posterior obtuse; sculpture as on head. Elytra broader than the thorax, longer than broad, a little longer than the thorax, yellow, with the apical third sharply black, rugosely punctured. Abdomen distinctly narrowed behind, closely punctured, and shortly pubescent; apex black.

Mustique Island, Grenadines (*H. H. Smith*), St. Vincent. Type in my collection.

23. *Echiaster sharpi*, sp. n.

Narrow, elongate, dull; head and thorax ferruginous, the former orbicular. Elytra black, obscurely lighter at the shoulders and longer than broad. Abdomen black. Antennæ and legs testaceous.

Length 3 mm.

Facies of *E. orbifer*, Shp., but colour entirely different, the thorax wider at the anterior angles and with a raised central line, and the elytra shorter.

Head large, orbicular; eyes large, their diameter much greater than the length of the temples; sculpture close, rugose, umbilicate. Antennæ reddish testaceous, of similar structure to the preceding. Thorax narrower than the head,

distinctly longer than broad, oval-oblong, carinate in centre ; anterior angles rounded, posterior obtuse ; sculpture as on head. Elytra black, lighter at the shoulders, distinctly longer than broad, and little longer than the thorax, closely and rugosely punctured. Abdomen black, narrower at apex, which is obscurely lighter, closely punctured, and shortly pubescent.

Jamaica (Hope River district). Type in my collection.

24. *Echiaster distinctus*, sp. n.

Narrow, elongate, dull, pitchy black ; head subquadrate ; elytra obscurely lighter at the shoulders, as broad as long. Antennæ and legs testaceous.

Length 2·8 mm.

Facies somewhat similar to *E. minutus*, Shp., but differs by the coloration, more robust build, longer thorax, and shorter elytra. From *E. sharpi* it is easily distinguished by the differently shaped head, obviously shorter and broader thorax, and shorter elytra.

Head large, subquadrate, longer than broad, posterior angles rounded at the apex ; eyes rather small ; temples large, their length greater than the diameter of the eyes ; puncturation close, rugose, umbilicate. Antennæ as in preceding. Thorax narrower than the head and elytra, broadest at the anterior angles which are rounded, the posterior angles obtuse, scarcely longer than broad, carinate posteriorly in the middle line ; sculpture as on head. Elytra as long as broad, black, reddish testaceous at the shoulders, closely and rugosely punctured. Abdomen pitchy black, ferruginous at apex, closely punctured and shortly pubescent.

Jamaica (Wag Water River). Type in my collection.

25. *Echiaster impressicollis*, sp. n.

(Fauvel, *in litt.*)

Narrow, elongate, dull, strongly narrowed posteriorly, dirty brownish testaceous ; abdomen black at apex. Antennæ and legs testaceous.

Length 4 mm.

In size, general appearance, and coloration (excepting the elytra, which are of same colour as the head and thorax) resembles *E. signatus*, Shp. ; but differs from this species by the shorter, broader, less attenuated head, shorter, uniformly coloured, and much more coarsely sculptured elytra.

Head longer than broad, oval, gradually rounded and contracted behind the eyes, without trace of posterior angles,

coarsely and rugosely punctured. Antennæ as long as the head; first joint elongate, stout; second globose; third and fourth of equal length, much longer than broad; fifth and sixth of equal length, longer than broad, but much shorter than third and fourth; seventh to tenth transverse, gradually increasing in breadth; eleventh about as long as the two preceding together, acuminate; the last five joints pilose. Thorax long and narrow, twice as long as broad, widest at the middle, gradually narrowed in front and behind with all the angles obliterated, closely and rugosely sculptured. Elytra not longer than the thorax, very coarsely, but not very closely punctured, with a coarse pubescence; intervals between the punctures smooth and shining. Abdomen strongly pointed, the first four visible segments very coarsely punctured and pubescent, the intervals shining and smooth, the last two segments very finely punctured and pubescent, shining, blackish.

Balthazar, Grenada (*H. H. Smith*). Type in the British Museum.

26. *Monista personata*, sp. n.

(Fauvel, *in litt.*)

Ferruginous, rather shining; elytra lighter. Antennæ and legs testaceous.

Length 2.8 mm.

Size and build of *M. plagiata*, Shp., from which it differs by the uniformly coloured elytra, less shining appearance, and the remarkable depressions on the head in male.

Head large, orbiculate; labrum emarginate; eyes small; temples large; posterior angles completely effaced; puncturation scattered, large, superficial, umbilicate, and with a fine coriaceous ground-sculpture. Antennæ pilose; first joint elongate, stout; second shorter than first and third, third and fourth longer than broad, fifth to seventh globose, eighth to tenth transverse; eleventh rather stout, scarcely as long as the ninth and tenth together. Thorax narrower than the head and elytra, a little longer than broad, oval, widest about the middle, with all the angles effaced, with sparing, superficial, umbilicate punctures and a fine wrinkled ground-sculpture. Elytra longer than the thorax, longer than broad; puncturation fine and obsolete on a polished ground, sparingly pubescent. Abdomen finely and sparingly punctured and pubescent.

♂. Vertex of head with a large, deep, semicircular impression on either side of middle line, which is reduced to

a narrow carina separating the two impressions. Last ventral plate very feebly and broadly emarginate.

Grenada (*H. H. Smith*). Type in the British Museum collection.

27. *Stilicus jucundus*, sp. n.

(Fauvel, *in litt.*)

Bronze-black, rather dull; elytra shining, with the apical border narrowly testaceous. Antennæ and legs testaceous. Length 4 mm.

In general appearance and coloration very similar to *S. muticus*, Shp., but differs by the narrower and more coarsely punctured thorax, with broader smooth central line, much more coarsely punctured elytra, and the male characters.

Head large, transverse, with the eyes broader than the elytra; posterior angles completely rounded; eyes large; puncturation close, umbilicate. Labrum testaceous. Antennæ with first joint elongate, rather stout; second shorter than first and third; fourth distinctly, fifth and sixth slightly, longer than broad; seventh to tenth about as long as broad; eleventh not so long as the two preceding together. Thorax a little longer than broad, widest at the anterior angles, which are rounded, considerably narrowed in front, a little rounded and gradually narrowed to the posterior angles, which are a little obtuse, narrower than the head and elytra; disc with a rather broad, smooth, central line in nearly the whole length; puncturation similar to, but rather coarser than, that of the head. Elytra a little longer than the thorax, as long as broad, coarsely but not closely punctured, with the apical margin narrowly, and the postero-external angles more broadly, testaceous, shining. Abdomen black, shining, pretty closely and finely punctured and pubescent.

*Observe.*—In some specimens a slight violet shade is noticeable.

♂. Last ventral plate with deep triangular excision.

St. Vincent (*H. H. Smith*). Type in the British Museum collection.

28. *Stilicus agnatus*, sp. n.

(Fauvel, *in litt.*)

Black, a little shining. Elytra narrowly testaceous at apical margin. Antennæ and legs testaceous.

Length 4 mm.

Very similar to the preceding, so that a detailed description is unnecessary. It differs by having the head and thorax



more shining and rather more coarsely punctured, the anterior thoracic angles more distinct, and the less closely punctured and pubescent abdomen, and the male characters.

♂. Last ventral plate with deep triangular excision, the penultimate impressed in the middle line and sinuate on either side.

Grenada (*H. H. Smith*). Type in the British Museum.

### 29. *Stilicus insularis*, sp. n.

Black, dull; elytra shining, unicolorous, obsoletely punctured. Antennæ (except last two or three joints) and legs pitch-brown.

Length 4 mm.

Head large, transverse, with the eyes a little broader than the elytra, posterior angles rounded; eyes large; vertex with small, smooth, shining spot. Labrum and palpi pitch-black; puncturation close, umbilicate. Antennæ pitch-black, with the last two or three joints testaceous; first joint long, stout; second shorter than first, about as long as third; third and fourth a little longer than broad; fifth to tenth moniliform; eleventh short, acuminate. Thorax as long as broad, narrower than the head and elytra, trapezoidal, widest at the anterior angles, which are distinct and obtuse, strongly narrowed in front, less strongly contracted in almost a straight line to the posterior angles, which are obtuse; disc with a smooth, shining, central space in its whole length; puncturation as on head. Legs pitchy brown; tarsi testaceous. Elytra about a third longer than the thorax, slightly longer than broad, shining black, with very fine sparing puncturation. Abdomen pretty finely and moderately closely punctured and pubescent.

♂. Last ventral plate with semicircular emargination, penultimate with two small tubercles near the posterior margin, separated by a semicircular impression with the convexity forwards.

Jamaica (Chester Vale district). Type in my collection.

### 30. *Stilicus cupreus*, sp. n.

Head, thorax, and abdomen bronze-black with coppery reflex; elytra brown, shining, with distinct coppery reflex. Antennæ brown with base and apex lighter; legs pale testaceous; tibiæ infusate.

Length 4.3 mm.

Head transverse, posterior angles rounded, quite as broad

as the elytra. Labrum and palpi dark brown. Antennæ with first two joints reddish brown, third to eighth dark brown, ninth to eleventh testaceous; first joint elongate, stout; second shorter than first and third; third to sixth longer than broad, gradually decreasing in length; seventh to tenth moniliform; eleventh short, oval. Puncturation close, umbilicate, with small, smooth, shining space on the vertex. Thorax trapezoidal, scarcely longer than the breadth at the anterior angles, which are distinct and obtuse, gradually narrowed in a straight line to the base, more strongly narrowed in front; disc with smooth central line throughout; puncturation as on head. Elytra distinctly longer than the thorax, longer than broad, with moderately coarse and rugulose puncturation. Abdomen shining, coppery bronze, closely and finely punctured and pubescent.

Jamaica (Newcastle district, 3000 feet above sea-level).

A single female. Type in my collection.

### 31. *Thinocharis fuscina*, sp. n.

(Fauvel, *in litt.*)

Ferruginous; head blackish, truncate posteriorly; elytra more or less infusate on disc; head, thorax, and elytra closely and distinctly punctured.

Length 3 to 3·3 mm.

Exceedingly close to *S. densicollis*, Shp., in general appearance and shape of head; but differs by the average smaller size, less robust build, narrower thorax, and the male characters.

Head transverse, quadrate, broader than the thorax, truncate posteriorly; eyes rather large, their diameter equal to the length of the temples; posterior angles rectangular, pretty closely punctured, and finely wrinkled, sparingly pubescent, sides with well-marked setæ. Antennæ as long as the head and thorax, furnished with long hairs; first joint long and stout; second about half the length of the first and less thickened; third to tenth longer than broad, and scarcely differing in length and breadth, much more slender than second; eleventh elongate, acuminate. Thorax a little broader than long, broadest at the anterior angles, which are obtusely rounded, gradually narrowed behind to the posterior angles which are effaced; puncturation fine, close, umbilicate; disc with smooth central line; sides setiferous. Elytra broader and distinctly longer than the thorax, longer than broad, testaceous, more or less infusate on the disc, leaving the sides and apex clear; puncturation finer than

that of the thorax, umbilicate, moderately pubescent. Abdomen pretty closely and finely punctured and pubescent throughout.

♂. Last dorsal plate deeply and semicircularly incised; fifth ventral plate with deep semicircular notch on either side of middle line, which forms a triangular lobe separating the notches; sixth ventral plate with a deep triangular notch.

Grenada (*H. H. Smith*). Type in British Museum.

### 32. *Thinocharis smithi*, sp. n.

(Fauvel, *in litt.*)

Entirely black, rather shining; head large, transverse; elytra not longer than the thorax. Antennæ and legs reddish testaceous.

Length 2.5 mm.

Remarkable by its broad head, which is considerably wider than the thorax and elytra, and the shortness of the latter.

Head with eyes considerably broader than long; eyes very large, their diameter much greater than the length of the temples and occupying nearly all the side of the head; temples very small; posterior angles rounded; puncturation moderate, pretty close, umbilicate. Antennæ reddish testaceous, pilose; first joint rather long and stout; second about half as long as first and about as thick; third to tenth longer than broad, gradually decreasing in length, the first of them about as long as, but much more slender than, second, the last of them a little longer than broad; eleventh oval, pointed. Thorax broader than the elytra, a little broader than long, broadest at the anterior angles, which are obtuse, gradually narrowed behind in a straight line to the posterior which are effaced; puncturation umbilicate, coarser and not so close as on the head; disc with smooth shining central line. Elytra as long as broad, slightly widened behind, narrower than, and about as long as, the thorax, with coarse scattered puncturation and coarse sparing pubescence. Abdomen moderately finely and closely punctured with rather fine pubescence.

♂. Fifth ventral plate broadly emarginate posteriorly, sixth ventral plate with triangular notch in the posterior margin.

Grenada (*H. H. Smith*). Type in the British Museum.

33. *Ophiomedon anthracinus*, sp. n.(Fauvel, *in litt.*)

Entirely black, dull. Antennæ black, with the apex of last joint yellowish. Legs dark brown.

Length 5.5–6.3 mm.

Head square, as broad as the elytra, truncate posteriorly; eyes small, their diameter much less than the length of the temples, which are long and parallel; posterior angles right angles, only blunted at the extreme apex; mouth-parts brown. Antennæ long, rather slender, pilose; first joint stout, elongate; second much shorter than first and third; third much shorter than first; fourth to tenth longer than broad, gradually decreasing in length; eleventh oval, pointed, longer than tenth; puncturation close, umbilicate, not very coarse. Thorax scarcely longer than broad, widest at the anterior angles, which are obtuse, gradually narrowed posteriorly in a straight line. Puncturation similar to, but rather finer than, that of the head; disc with a fine channel posteriorly. Elytra distinctly longer than the thorax, longer than broad, pretty closely and finely punctured. Abdomen closely and finely punctured.

♂. Last ventral plate with a deep triangular excision; the penultimate rather deeply and broadly emarginate, the base of the emargination rounded, the angles produced a little backwards, and, together with the sides of the notch, turned and folded to form on either side a spoon-shaped structure with the concavity inwards.

St. Vincent (*H. H. Smith*). Type in the British Museum.

34. *Medon cingulatus*, sp. n.(Fauvel, *in litt.*)

Pitch-brown or pitch-black, dull; apical third or half of the elytra, apex of abdomen, antennæ, and legs reddish testaceous. Tarsi simple.

Length 3.5 mm.

Size and build of *L. infuscatus*, readily distinguished by the much smaller eyes, the rectangular posterior angles of the head (which, with the thorax, is much more finely punctured), and the coloration of the elytra.

Head large, square, as broad as the thorax; eyes moderate; temples considerably longer than their diameter; base truncate, posterior angles rectangular; sculpture coriaceous, with very fine, obsolete, scattered punctures; sides with



well-marked setæ. Antennæ with first joint long and rather stout; second, third, and fourth of equal length, each a little longer than broad; fifth and sixth moniliform; seventh to ninth transverse, gradually increasing in width; tenth about as broad as long; eleventh oval, pointed; the first four joints setose, the rest pilose. Labrum bidentate, with small notch between the teeth. Thorax a little longer than broad, widest at the anterior angles, which are obtuse, gradually narrowed behind, with the posterior angles broadly rounded; centre of disc with trace of median line; sculpture coriaceous, with very fine, obsolete, scattered puncturation; sides with well-marked setæ. Elytra longer than broad, longer than the thorax and scarcely narrower, the apical third or half reddish testaceous; puncturation pretty close, fine, and aciculate, moderately closely pubescent. Abdomen closely punctured and pubescent throughout; apex reddish testaceous.

♂. Last ventral plate distinctly emarginate.

St. Vincent, Grenada (*H. H. Smith*). Type in the British Museum.

### 35. *Aderocharis conifer*, sp. n.

(Fauvel, *in litt.*)

Black, dull; sides, postero-external angles and apical margins of the elytra, posterior margins of the dorsal abdominal segments, apex of the abdomen, antennæ, and legs reddish testaceous.

Length 6 mm.

Somewhat resembling *A. latro*, Shp., but smaller, thorax narrower, elytra longer, and differently coloured.

Head large, quadrate, as broad as the elytra; eyes small, their diameter considerably less than the length of the temples, which are long and parallel; posterior angles right angles, just blunted at the extreme apex; vertex emarginate before the neck, and with a trace of fine line towards the front. Labrum, mandibles, and palpi red; puncturation very fine and close. Antennæ reddish, pilose; first joint long and stout; second much shorter than first; third longer than broad, gradually decreasing in length; fourth to tenth longer than broad, gradually decreasing in length; eleventh oval, pointed, not much longer than tenth. Thorax about as long as broad, narrower than the elytra, broadest at the anterior angles, which are obtuse, gradually narrowed in a straight line to the posterior angles, which are rounded; disc with a narrow smooth central line; the rest of the surface

densely and finely punctured. Elytra longer than the thorax, longer than broad, pitchy, the sides broadly, the apex narrowly, reddish, densely finely, but rather roughly, punctured. Abdomen black, the posterior margins of the first four visible segments narrowly, the penultimate broadly, and the last entirely reddish testaceous, finely and densely punctured and pubescent throughout.

♂. Fifth ventral plate produced in the middle into a triangular lamella, with emarginate apex and closely beset with black setæ, which bears near the base on either side a large, broad, smooth tooth; sixth ventral plate with broad deep emargination.

St. Vincent (*H. H. Smith*). Type in the British Museum.

36. *Aderocharis obscurior*, sp. n.

(Fauvel, *in litt*)

Black, dull; elytra reddish brown; posterior margins of the dorsal abdominal segments and apex obscurely lighter.

Length 6 mm.

Very closely allied to the preceding, so that a detailed description is unnecessary, and from which it differs by the more uniform reddish-brown colour of the elytra and the more obscure coloration of the abdomen.

No sexual differences observed; all the specimens appear to be females.

Grenada (*H. H. Smith*). Type in the British Museum.

37. *Scopæus angusticollis*, sp. n.

(Fauvel, *in litt.*)

Reddish brown, not very shining; abdomen lighter; antennæ, legs, posterior margins of the abdominal segments and apex testaceous.

Length 3.8 mm.

Size and colour of *S. ligulifer*, Shp., but distinct by its longer head and thorax, longer and much more finely punctured elytra.

Head longer than broad, broader than the elytra; temples long, parallel; vertex emarginate posteriorly; posterior angles rounded; closely and finely punctured throughout. Antennæ with first joint rather long and stout; second to sixth longer than broad, gradually decreasing in length; seventh to tenth globose; eleventh oval, pointed. Thorax narrower than the head, distinctly longer than broad, widest at the anterior angles, which are rounded but traceable, very

slightly narrowed to the posterior angles; disc with a very fine median line posteriorly and obsolete impression on either side before the base; puncturation fine and close, much finer than on the head, sparingly pubescent. Elytra distinctly longer than the thorax, much longer than broad, finely and closely but less distinctly punctured than the thorax. Abdomen closely and finely punctured and pubescent.

♂ unknown.

Grenada (*H. H. Smith*). Type in the British Museum.

38. *Scopæus auripilis*, sp. n.

(Fauvel, *in litt.*)

Dull; head and thorax ferruginous or black; elytra black, with apical margin sharply testaceous; abdomen black, somewhat shining, the posterior third of seventh and posterior half of eighth dorsal plates sharply testaceous. Antennæ and legs testaceous. The whole insect rather thickly clothed with yellowish pubescence.

Length 3 mm.

A species very distinct by its coloration and pubescence.

Head as broad as long, a little broader than the thorax at the anterior angles; temples parallel; vertex emarginate posteriorly; posterior angles right angles, only blunted at the extreme apex; puncturation close, rugulose, umbilicate; pubescence yellow, distinct. Antennæ with first joint elongate, stout; second and third of equal length; fourth shorter than third, a little longer than broad; fifth to seventh globose, eighth to tenth transverse, eleventh shortly oval. Thorax scarcely longer than broad, widest at the anterior angles, which are obtuse, gradually narrowed behind to the posterior angles, which are rounded, more abruptly narrowed in front to the neck; disc with a very fine shining carinula behind, but without trace of basal foveæ. Puncturation and pubescence as on the head. Elytra slightly longer than the thorax, a little longer than broad, the apical margin distinctly testaceous, the shoulders sometimes obscurely lighter; puncturation close and rugulose, rather finer than that of the thorax, especially behind; pubescence distinct, yellow. Abdomen slightly widened behind, less dull than the fore parts, the posterior third of seventh and posterior half of eighth dorsal segment sharply testaceous, pretty closely and finely punctured, and with rather long yellow pubescence.

♂ unknown.

St. Vincent, Grenada (*H. H. Smith*). Type in the British Museum.

39. *Scopæus simplicicollis*, sp. n.(Fauvel, *in litt.*)

Narrow, elongate, scarcely shining; head ferruginous; thorax black; elytra and abdomen black, the apical border of the former and the posterior margins of the dorsal segments and apex of the latter narrowly reddish testaceous. Antennæ and legs reddish testaceous.

Length 2·3 mm.

In size, and superficially, resembles *S. umbra*, Shp.; but differs from it by the darker coloration, broader, differently shaped head, much coarser puncturation of the fore parts, the absent or very obsolete basal foveæ of the thorax, and the male characters.

Head a little longer than broad, as broad as the elytra; temples very slightly dilated and feebly narrowed to the posterior angles, which are rounded, emarginate at the posterior border, closely and finely punctured, finely pubescent. Antennæ with first joint stout, elongate; second to sixth longer than broad, gradually decreasing in length; seventh to tenth globose; eleventh short, oval. Thorax narrower than the head, distinctly longer than broad, broadest at the anterior angles, which are rounded, abruptly narrowed in front, gradually narrowed behind to the rounded posterior angles; disc with a very fine median line throughout the entire length, but without or with very obsolete basal foveæ; puncturation close, a little coarser than on the head. Posterior tarsi short. Elytra a little longer than the thorax, distinctly longer than broad, similarly punctured to the thorax, finely pubescent. Abdomen very finely and moderately closely punctured and pubescent.

♂. Sixth ventral plate with a broad semicircular emargination of the posterior border; fifth ventral plate with a broad, very feeble emargination.

St. Vincent, Grenada (*H. H. Smith*). Type in the British Museum.

*Scopæus umbra*, Shp.

This species was described in the 'Biologia Centrali-Americana' (i. 2, p. 544) from female specimens, the male being then unknown. This sex has the sixth ventral plate narrowly and deeply excised in the middle line; fifth ventral plate longitudinally impressed in the middle, the impression furnished with short black setæ.

It is found in Grenada (*H. H. Smith*), Haiti, and Jamaica.



40. *Scopæus marginatus*, sp. n.

Black, not very shining (greasy lustre only), the posterior margin of the elytra narrowly but brightly reddish testaceous; legs and last six joints of the antennæ reddish testaceous; the basal half infusate.

Length 3 mm.

Size and build of *S. ligulifer*, Shp., from which it differs by the finer puncturation of the head and thorax, the coloration, and the male characters.

Head square, a little broader than the thorax; the temples parallel; the posterior angles bluntly rectangular, the posterior margin slightly emarginate. Antennæ with first seven joints longer than broad, gradually decreasing in length, the last of them slightly oval; eighth to tenth as long as broad; eleventh oval, pointed; puncturation very fine and close; pubescence very fine and sparing. The thorax a little longer than the greatest width, which is at the anterior angles, which are obtuse but distinct; the disc without basal impressions and with a feeble trace of central line in front only; puncturation very fine and close; pubescence fine. Elytra a little longer than the thorax, longer than broad, finely and closely punctured, finely pubescent. Abdomen black, extreme apex brownish; puncturation and pubescence fine and close throughout. Posterior tarsi short.

♂. Sixth ventral plate with deep triangular excision of the posterior margin, fifth slightly emarginate and feebly impressed, second and third with slightly curved, transverse, impressed line before the posterior borders, the concavity backwards.

Jamaica. Type in my collection.

41. *Scopæus antennalis*, sp. n.

Black, not very shining (greasy lustre only); elytra uniform dark brown; legs and last joints of the antennæ reddish testaceous.

Length 3.5 mm.

This species is so similar to the preceding that a detailed description is unnecessary. It differs from it by larger and more robust build, the thorax more finely punctured, the antennæ are longer, all the joints longer than broad and the first five or six infusate, the elytra unicolorous, the abdomen more densely pubescent, and the male characters.

♂. Sixth ventral plate with deep triangular excisions at the posterior margin; fifth ventral plate feebly emarginate.

Haiti. Type in my collection.

## MICRANOPS, gen. nov.

Body elongate, apterous. Head oval-oblong, a little broader than the thorax, longer than broad, emarginate posteriorly, the neck about one-third the breadth of the head. Eyes wanting, their position marked by a small, round, whitish depression. Labrum transverse, bidentate, the teeth separated by a narrow triangular notch, setose. Mandibles falciform, with three blunt teeth about the middle. Maxillæ with the inner lobe ciliate internally, the outer ciliate at apex. Maxillary palpi of normal length; first joint very small; second elongate, about the length of third, the latter thickened towards the apex; fourth minute, subulate. Labium transverse. Tongue small, acuminate; paraglossæ of similar size and shape. Labial palpi with first and second joints cylindrical; second a little longer than first; third slender, pointed. Gular sutures diverging in front and behind, most approximate about the middle. Antennæ filiform, straight. Thorax oblong, as wide as the elytra, with the angles rounded. Scutellum small, triangular. Elytra shorter than the thorax, transverse. Abdomen bordered, slightly widened before the apex, seventh dorsal segment without a membrane at the posterior border; first ventral plate furnished with a short keel at the base; anal styles not exposed. Legs rather short, thighs stout, anterior tibiæ excavate internally. Tarsi five-jointed, the anterior (at least in ♂) dilated, middle and posterior short, simple; the first four joints subequal, fifth shorter than the first four united; claws simple. Tibiæ pubescent.

Stands near *Lathrobium* and *Scopæus*; from the first it differs in the bidentate labrum, the tridentate mandibles, pointed ligula, and structure of the posterior tarsi; from *Scopæus* it differs by the bidentate labrum, simple ligula, and stout neck, but agrees with it in the structure of the posterior tarsi. It has the facies of a minute *Lathrobium*.

42. *Micranops brunneus*, sp. n.

Dark chestnut-brown, scarcely shining; head and thorax strongly coriaceous, with superficial scattered puncturation; mouth-parts, antennæ, and legs testaceous.

Length 2·3 mm.

Head oval-oblong, longer than broad, emarginate posteriorly, posterior angles rounded. Eyes absent, their position marked by a round whitish depression. Antennæ testaceous; first joint stout, not quite so long as the three following

united; second a little longer and stouter than third; third and fourth of about equal length, a little longer than broad; fifth and sixth square, seventh and eighth globose, ninth and tenth transverse, eleventh short. Puncturation superficial, scattered; ground-sculpture very distinct, coriaceous; pubescence scanty. Neck one-third the width of the head. Thorax oblong, a little narrower than the head, scarcely wider at the anterior than at the posterior angles, which are all rounded; ground-sculpture as on head; disc with broad impunctate central area extending the whole length and a very narrow, shining, smooth median line; the rest of the surface with rather large superficial puncturation; pubescence scanty; angles each with rather weak seta. Elytra much shorter than the thorax, slightly widened behind, a little broader than long, with rather coarse rugulose sculpture and without visible ground-sculpture. Abdomen bordered, a little widened before the apex, finely and sparingly punctured, especially behind, with fine reticulate ground-sculpture and fine sparing pubescence; seventh segment not furnished posteriorly with a membranous border.

♂. Sixth ventral plate with small triangular emargination, fourth and fifth rather broadly impressed in the middle line.

Jamaica (Newcastle district, 3000 feet above sea-level). Type in my collection.

XL.—*On new Species of Histeridæ and Notices of others, with Descriptions of new Species of Niponius.* By G. LEWIS, F.L.S.

[Plate VIII.]

I PROPOSE to call this paper the fortieth of the series, now ranging over many years, in this Magazine, notwithstanding that the genus *Niponius* has been assigned lately to a new family, *Niponiidæ*, by the consension of entomologists generally. The figures of the *Histeridæ* given have been drawn from the types in the British Museum; those of the *Niponius* are in my collection.

*List of Species, arranged generically.*

*Niponius foveicollis.*  
 — *unistrius.*  
 — *interstitialis.*  
 — *unidentatus.*  
*Trypanæus junceus.*  
 — *bispinus, Mars.*  
 — *carinirostris, Mars.*

*Cylistix asiaticus, Lew.*  
*Eblisia beatula.*  
*Exorhabdus crenulistrius.*  
*Hister asperatus.*  
 — *terrenus.*  
*Onthophilus tuberculatus, Lew.*  
 — *sculptilis, Lew.*

*Niponius foveicollis*, sp. n. (Pl. VIII. fig. 6.)

Elongatus, cylindricus, niger, nitidus; fronto in medio transverso lævi; pronoto 4-foveolato; elytris striis suturali, apice abbreviatis, cæteris obsoletis; propygidio 4-foveolato; pygidio profunde bi-foveolato.

L. 5 mill.

Elongate, cylindrical, black, and shining; the head irregularly punctured, points varying in size, on the vertex there is a transverse smooth space which is marginate anteriorly and narrows behind in the middle and then widens out irregularly before the neck; the thorax has large irregular punctures and four foveæ, two near the anterior angles, two behind the middle of the disc; the elytra, the sutural stria, which is a little shortened apically, is markedly continued along the bases and turns backward before reaching the humeral angle, and there apparently represents the first dorsal stria, the other striæ are obsolete or consist of linear punctures; the pygidia are very smooth; the propygidium has two small centre foveæ and two larger ones near the edges; the pygidium has two large foveæ almost circular in outline; the prosternum, striæ strong and feebly joined posteriorly and markedly terminating without joining anteriorly; the mesosternum is somewhat widely canaliculate; the metasternum, the canaliculation is narrower but more marked, and the surface punctuation is extremely fine; the anterior tibiæ are bidentate.

*Hab.* Pengalengan, 4000 feet, Western Java (*H. Fruhstorfer*, 1893).

*Niponius unistrius*, sp. n. (Pl. VIII. fig. 5.)

Cylindricus, parum robustus, niger, nitidus, abdomine pedibusque rufis; elytris punctatis, unistriatis, basi marginatis; propygidio parum dense punctulatis, haud foveolato; pygidio utrinque arcuatim sulcato.

L.  $5\frac{1}{3}$  mill.

Cylindrical, rather robust, black, and shining, legs and abdominal segments red; the head somewhat rugosely punctured, carinæ on the cephalic armature well marked; the thorax, surface punctured more clearly than the head, with two large foveæ, one on each side of the disc, and a transverse impression on the edge behind the anterior angle; the elytra strongly margined along the bases, with one short stria near the humeral angle, surface clearly but not densely punctulate (points smaller than those of the thorax); the propygidium is more finely and more closely punctulate, without



notable foveæ, but on each side close to the edge is a very small one; the pygidium is similarly pointed, with an arched sulcus extending along the sides; the prosternum has sulci in lieu of striæ similar to those figured for *andrewesi* (Ann. & Mag. Nat. Hist. ser. 7, vol. xiv. p. 151, pl. vi. fig. 3 a, 1904); the mesosternum is less shortened than that of *andrewesi*, but, like it, it has two lateral grooves and a median fovea on the posterior edge; the metasternum is conspicuously but not densely punctate, the median canaliculation is narrowed in the middle and somewhat slight; the anterior tibiæ are bidentate.

*Hab.* Andaman Islands.

*Niponius interstitialis*, sp. n. (Pl. VIII. fig. 4.)

Cylindricus, robustus, piceus, nitidus, abdomine rufo-brunneus; thorace haud foveolato; elytris tenuiter striatis; propygidio 4-foveolato; pygidio profunde bifoveolato.

L.  $5\frac{1}{3}$  mill.

Cylindrical, rather robust, piceous, and shining, abdomen and legs reddish brown; the head finely but rather densely punctate, cephalic armature with two well-marked carinæ; the thorax somewhat reddish at the anterior angles, punctuation somewhat dense but of varying sizes, without foveæ; the elytra, sutural stria is shortened apically but joins the basal margin, the three striæ next the sutural are broken and punctiform and the outer striæ are wanting, the surface is punctulate including the interstices of the striæ; the propygidium is wholly punctured and has four foveæ, the outside ones are largest and circular; the pygidium has two large lobe-shaped foveæ, and the surface around them is punctulate; the prosternum is markedly striate, striæ are feebly sinuous before the coxæ, conspicuously joined posteriorly, and feebly and transversely meeting in front (similar to *impressicollis*); the meso- and metasterna are deeply canaliculate in the middle, the latter is very finely punctulate; the anterior tibiæ are bidentate.

*Hab.* Somerset, Australia (*M. L. d'Albertis*, 1875).

*Niponius unidentatus*, sp. n. (Pl. VIII. fig. 7.)

Cylindricus, brunneus, nitidus; thorace haud foveolato; elytris striis obsoletis; propygidio 4-foveolato; pygidio bifoveolato; tibiis anticis unidentatis.

L. 3 mill.

Cylindrical, brown, and shining; the head, cephalic armature obtuse (similar to *obtusiceps*), surface somewhat densely

and rugosely punctured; the thorax also similarly pointed, not foveolate, but there is a slight transverse impression behind the anterior angle; the elytra, sutural stria is traceable and also a short stria near the shoulder, the others are obliterated by the punctuation; the propygidium has four shallow foveæ; the pygidium, surface punctured with two foveæ, nearly circular, at the base; the prosternum, striæ meet at both ends and are somewhat fine and parallel laterally; the meso- and metasterna are canaliculate and the latter is very finely puncticulate; the anterior tibiæ have a single tooth only.

*Hab.* Singapore.

*Trypanæus junceus*, sp. n.

♀. *Elongatus*, cylindricus, niger, nitidus; fronte leviter biimpressa, laud sulcato, rostro apice trigono; pronoto antice bituberculato, punctato; propygidio pygidioque distincte punctatis; prosterno parallelo marginato; tibiis anticis 5-dentatis.

♂. Fronte concava, rostro apice obtuso reflexo; pronoto grosse punctato.

L. 5 mill.

♀. *Elongate*, cylindrical, black, and shining; the head, the rostrum is triangularly reflexed at the apex and has two lateral longitudinal impressions, flat and smooth between the eyes; the thorax is punctate, not very densely, with two small tubercles behind the head; the elytra are very finely and sparsely punctulate; the pygidia are punctate like the thorax, but more densely; the prosternum is laterally parallel and marginate and truncate anteriorly.

♂. Forehead concave between the eyes, with the rostrum obtusely reflexed at the apex, and the punctures of the thorax are larger and more close.

This species is smaller and much less robust than *noxius*, *nasicornis*, and *volvulus*, to which section of the genus it belongs in having the rostrum bulging at the sides. The prosternum is relatively shorter also than in the others named.

*Hab.* French Guyana.

*Trypanæus carinirostris*, Mars.

In his description of this species Marseul says that the thorax is "4-tuberculato," but I have specimens from Guiana which agree with his figure, which has only two, and also with his description generally.

*Trypanæus bispinus*, Mars.

I have the type of this from the Chevrolat Collection; it is a species very similar indeed to *terebrians*, Lew., in which the prosternal striæ meet gradually in front; in *bispinus* the striæ meet acutely, Marseul says "prosternum en triangle allongé."

*Eblisia beatula*, sp. n.

Late ovalis, convexa, nigra, nitida; fronte transversa, depressa, stria recta, valida; pronoto stria lateraliter valida, interstitiis latis; elytris striis 1-3 integris, 4-5 brevibus, suturali utrinque abbreviatis; propygidio transverso punctato; pygidio basi utrinque profunde foveolato; mesosterno recto, marginato; tibiis anticis 6-denticulatis.

L. 4 mm.

Broadly oval, convex, black, and shining; frontal stria well marked anteriorly and nearly straight, but bent on each side, with a transverse depression behind the stria, surface smooth; the thorax, marginal stria very fine, lateral stria strong and continuing behind the head, and is feebly sinuous before the base, interstice rather wide; the elytra, striæ 1-3 complete, 4-5 very short, apical, and equal in length; sutural discal, well shortened at both ends; the propygidium has a transverse row of punctures; the pygidium is smooth, with a large circular fovea on each side at the base; the mesosternum is straight anteriorly, marginal stria complete and continuing along the metasternum, the suture is scarcely visible; the tibiae, anterior 6-denticulate.

This species is more convex than *cavipyga*, Lew., and the elytral striæ are much less deep. *E. cavipyga* has the thoracic lateral stria markedly bent at the base. In my type example there is a third shallow fovea in the pygidium before the apex, but I doubt if this is a constant character.

*Hab.* Burma.

*Exorhabdus crenulistrius*, sp. n.

Ovatus, convexus, niger, nitidus; fronte bimpressa, stria carinata, recta; pronoto striæ laterali integris; elytris striis 1-3 integris, 4 basi obsoletis, 5 dimidiata, suturali basi abbreviata; propygidio pygidioque dense punctatis; mesosterno recto, marginato; tibiis anticis 3-dentatis.

L. 7-7½ mill.

Oval, convex, black, and shining; the head, frontal stria

carinate, straight anteriorly, and behind it are two impressions with rugose surfaces, and the space between them is rugose; the thorax, marginal stria very fine, with two well-marked lateral striæ; the inner stria continues behind the head and is feebly sinuous behind the eyes, at the anterior angle the interstice is punctured and there is a border-line of points along the base; the elytra, striæ deep and crenulate, outer humeral short and basal, inner humeral and 1-3 dorsal complete, 4 indistinctly shortened at the base, 5 apical and nearly dimidiate, sutural is bent and clearly abbreviated at the base; the pygidia are densely punctate; the mesosternum anteriorly is straight and marginate; the anterior tibiæ are 3-dentate, the apical tooth being very robust; this last character is common to all the species of *Exorhabdus*, and it is also seen in *Hister fossa*, *vadatus*, and others.

The general sculpture of this species resembles that of *aneus*; there is no band of thoracic punctures, but in one specimen there are a few irregular points at the anterior angle.

*Hab.* Mufungwa, Sampwe, Congo River (*Dr. Bequaert*).

### *Hister asperatus*, sp. n.

Breviter ovalis, convexiusculus, niger, nitidus; fronte stria antice sinuata; pronoto lateribus conspicue rugoso-punctato; elytris striis fortibus crenatis, 1-4 integris, 5 dimidiata, suturali basi abbreviata; propygidio pygidioque vix dense punctatis; mesosterno recto, marginato; tibiis anticis 3-dentatis.

L.  $11\frac{1}{2}$ - $12\frac{1}{2}$  mill.

Shortly oval, rather convex, black, and shining; the head obscurely punctulate above, stria well marked and sinuous anteriorly; the thorax, inner lateral stria complete, clear and crenulate behind the head, laterally it is irregular owing to the rugose sculpture, the outer stria ceases behind the eye and is shortened before the base, the sides are strongly and rugosely punctured, including the interstice; the elytra, outer humeral stria short, not reaching the base, and ceasing at a point opposite to where the inner humeral begins, inner humeral apical and dimidiate, striæ 1-4 deep and complete with crenulate edges, 5 apical and dimidiate, sutural well shortened anteriorly and bent, turning away from the suture at both ends, the interstices, especially those of the inner humeral and the first and second striæ are rugosely punctured on the apical half, and the apical border is irregularly rugose; the pygidia are rather closely punctate, the pygidium



is not margined apically; the mesosternum is straight and clearly marginate; the anterior tibiæ are 3-dentate.

This species is larger than *adjectus*, Mars., but it is very similar in outline.

*Hab.* Kaniri, Congo River (*Dr. Bequaert*).

*Hister terrenus*, sp. n.

Ovalis, convexiusculus, opacus, niger, rugoso-punctissimus; fronte stria antice sinuato; elytris stria tenuiter impressis vel obsoletis; prosterno angustato, marginato; mesosterno emarginato, stria marginali integra; tibiis anticis valide 3-dentatis.

L. 7 mill.

Oval, rather convex, opaque, and black, densely and rugosely punctate above, the frontal stria is fine but very distinct and feebly sinuous in front; the thorax, the marginal stria is very fine and close to the edge, and continues so behind the head, behind the head there is a second fine stria ending on each side behind the eyes and leaving a very narrow interstice, from the basal angle along one half of the thorax is a fine carinate stria close to the edge, in front of the scutellum there is a short linear smooth space, not very conspicuous; the elytra, the dorsal striæ are very fine, the lateral margin is finely carinate (this may represent the outer humeral stria), the inner humeral is complete and bent behind the base, 1-2 complete, 3 slightly shortened at the base, 4-5 almost obliterated, also the sutural; the pygidia are more coarsely sculptured than the thorax and the sculpture is somewhat reticulate; the prosternum, the keel is narrowed before the coxæ and has a marginal stria; the mesosternum is feebly emarginate, stria complete; the underside is more or less punctulate; the anterior tibiæ are robust and strongly 3-dentate.

The dorsal striæ of this species somewhat resemble those of *H. semigranosus*, Mars., but there is no known species similar to it. It will be figured shortly.

*Hab.* Mlanje, Nyasaland (*S. A. Neave*), 1912. One example in the British Museum.

EXPLANATION OF PLATE VIII.

*Fig. 1. Cylistix asiaticus*, Lew.

*Fig. 2. Onthophilus sculptilis*, Lew.

*Fig. 3. — tuberculatus*, Lew.

*Fig. 4. Niponius interstitialis*.

*Fig. 5. — unistrius*.

*Fig. 6. — foveicollis*.

*Fig. 7. — unidentatus*.

XLI.—*The Geographical Races of the Woolly Opossum*  
(*Philander laniger*). By OLDFIELD THOMAS.

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THE series now available of the *Philander laniger* group covers fairly well the chief area over which these beautiful animals are found—from Vera Cruz to Peru. Passing from north to south, they seem to fall into the following geographical races:—

S. Mexico.....	<i>Ph. l. aztecus</i> , subsp. n.
Guatemala .....	<i>Ph. l. fervidus</i> , subsp. n.
Costa Rica and Panama .....	<i>Ph. l. pallidus</i> , Thos.
Islands off Panama Coast .....	<i>Ph. l. nauticus</i> , subsp. n.
Western Colombia and N. Ecuador..	<i>Ph. l. derbianus</i> , Waterh. (syn. <i>pyrrhus</i> , Thos.), and <i>pictus</i> , subsp. n.
Santa Marta, Bogota, and Merida ..	<i>Ph. l. cicur</i> , Bangs.
Western Ecuador .....	<i>Ph. l. guayanus</i> , Thos.
Eastern Ecuador.....	<i>Ph. l. jivaro</i> , subsp. n.
Peru .....	<i>Ph. l. ornatus</i> , Tschudi.

The original “Micouré laineux” of Paraguay (*Ph. l. laniger*) and that described by Wagner as *Didelphys ochropus* from the lower Rio Negro no doubt also represent distinct races, but I have seen no specimens of either.

It is not yet clear what is the relation of the beautifully contrasted grey and red forms—such as *aztecus* and *pictus*—to those more uniformly coloured. One of each occurs in Western Colombia, though not in absolutely the same locality, but elsewhere only a single form is found in each of the areas mentioned above. It is remarkable how like *aztecus* and *pictus* are to each other, while the region between them is occupied by the more uniformly coloured *fervidus* and *pallidus*.

The possibility of making this study has hitherto been delayed by the difficulty of allocating the name *derbianus*, Waterhouse, 1841, based on a specimen of unknown locality with characters that might belong to any of the races, from Mexico to Peru. Now, however, thanks to the kindness of the authorities of the Liverpool Museum, I have had the loan of Waterhouse's type, which I find to agree fairly closely with the form of the Cauca Valley, my *Ph. l. pyrrhus* being therefore a synonym of it. This same identification was made—either by a clever guess or after examination of the type—by Dr. J. A. Allen in 1904\*.

\* Bull. Am. Mus. N. H. xx. p. 57 (1904).

These animals all vary a good deal in their coloration, as indicated by Dr. Allen, and the distinctions given must be looked upon as average ones. Enough specimens have, however, been examined to show that their average characters are sufficiently constant locally to be used for the distinction of the different subspecies.

The following are the descriptions of the new forms:—

*Philander laniger aztecus*, subsp. n.

Colours brightly contrasted. General colour rich ferruginous. Crown grey to behind level of ears. Withers-streak large, white, prominent. Rump and outer sides of hips grey all across, the grey also passing on to the hairy part of the tail. Forearms and wrists prominently white. Hind legs ferruginous. Under surface and inner side of limbs buffy whitish, the hairs not darkened basally.

*Hab.* (of type). San Juan de la Punta, Vera Cruz, Mexico. Another specimen from Teapa, Tabasco.

*Type.* Adult female. B.M. no. 94. 12. 18. 28. Received from the Museo Nacional, Mexico.

Distinguished from the otherwise rather similar *Ph. l. pictus* by the grey of the rump not being interrupted mesially and by the rusty-coloured hind limbs, these being in *pictus* whitish like the anterior pair.

*Philander laniger fervidus*, subsp. n.

Colours very deep and strong throughout. General colour rich cinnamon-rufous, the lighter markings yellow instead of grey. Head yellow to level of ears. Withers-mark well developed, strongly contrasted, buffy yellow. Under surface pale buffy yellow, the belly tending more towards ferruginous. Fore limbs to wrists buffy yellow. Hind limbs deep ferruginous. Naked part of tail wholly dark brown to end.

*Hab.* Guatemala.

*Type.* Adult female. B.M. no. 6. 10. 22. 1. Collected by J. Rodriguez. Presented by F. DuCane Godman, Esq.

The dark colour of the tail is unique in the group, but is paralleled among some of the species of *Metachirus*. Its very rich ferruginous colour and the yellowness of the light markings—whitish grey in other forms—will readily distinguish this handsome animal from all its allies.

*Philander laniger nauticus*, subsp. n.

Most nearly allied to *Ph. l. pallidus*, to which it has been hitherto referred, but the brown colour usual in the members

of the group less reduced, the general colour being about "sayal-brown" in all four specimens, as compared with the nearly completely grey colour of eight examples of true *pallidus*. Head little paler than body. No withers-mark perceptible. Under surface pale buffy. Forearms and wrists buffy whitish. Hind limbs pale brown.

*Hab.* Islands off the west coast of Panama. Type from Gobernador Island, others from Brava and Cebaco Islands.

*Type.* Adult male. B.M. no. 3. 3. 1. 124. Collected by J. H. Batty. Presented by the Hon. Walter Rothschild, F.R.S.

A browner and less peculiarly grey relative of the Chiriqui *Ph. l. pallidus*.

*Philander laniger pictus*, subsp. n.

A brightly marked form resembling *Ph. l. aztecus*. Colours sharply and strongly contrasted. Ground-colour rich ferruginous, light colours clear grey. Head grey to level of ears. Withers-mark prominent, large, clear greyish white. Under surface creamy white throughout. Fore limbs wholly greyish white, this colour also extending up into the body-colour behind the shoulders. Outer side of hips and whole of hind limbs clear greyish white, divided on the rump by the ferruginous body-colour, which becomes dark brown on the hairy part of the tail.

*Hab.* West Colombia and N. Ecuador. Type from Apia, Rio Apia, Cauca slopes of West Colombia. Alt. 5000'. Another specimen from St. Javier, N. Ecuador.

*Type.* Adult female. B.M. no. 10. 7. 16. 5. Collected 10th November, 1909, by Mr. M. G. Palmer.

In general appearance very like *Ph. l. aztecus*, but with the grey on the hips separated mesially, and with the hind limbs and feet white instead of brown.

*Philander laniger jivaro*, subsp. n.

Most nearly allied to *Ph. l. ornatus*, Tsch., the Peruvian representative of the group; but, while that is more or less rufous in general tone (a strongly marked specimen is nearest to "amber-brown," Ridgway), the present form is a dark golden brown without rufous tinge, most nearly approaching "cinnamon-brown" (Ridgway, 1912). Under surface averaging rather darker than in *ornatus*, the axillary hairs not lighter than those of the belly. Inguinal region dull white. Outer side of hips hoary grey. Tail with the difference in



extent of hair above and below over 4 inches; the base coloured like the back.

*Hab.* Eastern Ecuador. Type from Sarayacu on the Pastasa River. Another specimen from Canelos, on the Bobonasa, alt. 2100'.

*Type.* Adult male. B.M. no. 80. 5. 6. 75. Collected by Mr. Clarence Buckley.

From the dull-coloured *Ph. l. cicur* of Santa Marta and Bogota this subspecies differs by its greyer hips and the greater difference between the upper and lower extent of the hair of the tail; but it is no doubt intermediate in character as in locality between *ornatus* and *cicur*.

# XLII.—Three new Voles from the Inner Hebrides, Scotland.

By G. E. H. BARRETT-HAMILTON and MARTIN A. C. HINTON.

IN a paper recently read before the Zoological Society we gave an account of a collection of small mammals from the Inner Hebrides. This was made by Mr. R. W. Sheppard in 1912, working under the direction of Mr. W. R. Ogilvie-Grant, who organized and managed the expedition. Early in the present year Mr. Ogilvie-Grant arranged with Mr. D. Anderson and Mr. P. D. Montague to continue the field-work. Mr. Anderson went to the Outer Hebrides and subsequently to Rum and Eigg, while Mr. Montague visited Skye and the neighbouring islands of Raasay, Muck, and Eigg. Later, Mr. C. H. B. Grant completed the work in Skye. The resulting collections are of great importance, and when fully worked out will throw much light on several obscure problems. In the present note we have to describe a new species of *Evotomys* from Raasay and two new subspecies of the *Microtus agrestis* group, one from each of the islands Eigg and Muck.

## 1. *Evotomys erica*, sp. n.

*Hab.* RAASAY, Inner Hebrides. "Trapped in big heather, rather scarce" (*Montague*).

*Material examined.* Three adult, but not old, males. Dimensions:—

	Head and body.	Tail.	Hind foot.	Ear.
No. 79 (type), male, 15th April, 1913..	110	45	18	13
No. 80, " " " " ..	112	48	20	14.5
No. 81, " 18th " " ..	114	50	20	14

*External characters.* Like *E. alstoni* from Mull (Abstract P. Z. S. no. 119, 15th April, 1913, p. 18) in general appearance, but slightly larger and with very robust tail. The underside is much more heavily washed with buff, and is in sharp contrast with the dark-coloured flanks; the under surface of the tail is clear buff, and sharply contrasted with the dark brown of its upper side.

*Dental and cranial characters.* The cheek-teeth are of normal form, but are much larger than in *E. alstoni* or most other species of *Evotomys*, being scarcely smaller than those of *cæsarius*: *ch. t.* 3\* has always a deep third inner fold and usually a large fourth inner salient angle, but in no. 80 the latter is obsolete in the left tooth.

The *skull* is most readily distinguished from that of *E. alstoni* by its larger cheek-teeth, broader zygomatic arches, heavier jugals (their upper borders boldly convex), more prominent and extensive postorbital crests, less convex parietal region, wider pterygoid fossæ, with correspondingly narrower choanæ, and vertical instead of ventrally divergent pterygoids. The antero-internal part of each auditory bulla is produced into a blunt point instead of being rounded. The outer wall of the infraorbital canal is a little wider, the rostrum rather deeper and narrower, with smaller and narrower palatal foramina, the interorbital region slightly more constricted, and the palate relatively wider. The mandible is larger than in *alstoni*, its coronoid, condylar, and angular processes noticeably more robust; its inferior border is much thicker and the lower margin of the angle is broadened throughout into a wide surface for the insertion of the superficial part of the masseter muscle; the width of this surface is 1.4 mm., but in *E. alstoni* only 0.4 mm. For the cranial dimensions see table on p. 363.

*Remarks.* As we have pointed out elsewhere, *E. alstoni* is of interest, since in our opinion it represents in a somewhat modified form the type which in the late Pleistocene period was dominant in Western Europe. This type appears to have been ousted from the more favoured portions of its territory by an incoming rival, *E. glareolus*; and it survives only in islands, on mountains, or in the less hospitable northern districts. In each of such restricted stations it has suffered more or less profound modification in coping with the demands of purely local conditions, and therefore it is now represented

\* In this paper we write "*ch. t.*" instead of the usual "*m.*," because such a symbol is non-committal; in the opinion of one of us (see Proc. Geol. Assoc. xxi. p. 490, 1910) the anterior cheek-teeth of Microtinae are persistent "milk-molars," and the formula  $dm. \frac{1}{1} m. \frac{1.2}{1.2}$  the correct one for the group.

*Cranial Dimensions of E. erica and E. alstoni.*

	Condylar-basal length.	Zygomatic breadth.	Interorbital constriction.	Mastoid breadth.	(Occipital depth (median).	Nasal length.	Diastema.	Upper cheek-teeth (alveolar).	Mandible.	Lower cheek-teeth (alveolar).	Remarks.
<i>E. erica.</i>											
No. 79 .....	25.2	14.7	3.7	11.8	6.4	7.1	6.7	6.2	16.1	6.1	Young adult. Slightly older (molar roots not yet visible at alveolar border).
No. 81 .....	25.1	15.0	3.8	11.9	6.6	7.4	6.7	6.3	16.4	6.1	
<i>E. alstoni.</i>											
Type .....	25.3	13.9	3.8	11.5	6.4	7.5	7.1	5.6	15.6	5.4	Aged. Old (molar roots protrude).
No. 120 .....	24.1	13.5	3.9	11.4	6.0	6.8	6.3	5.2	15.1	5.4	
Ratios cross condylar-basal length = 100; —											
<i>E. erica.</i>											
No. 79 .....	100	58.2	14.7	46.7	25.4	28.1	26.6	24.6			
No. 81 .....	100	59.0	15.0	46.9	26.0	29.1	26.4	24.8			
<i>E. alstoni.</i>											
Type .....	100	54.9	15.0	45.4	25.3	29.6	28.0	22.1			
No. 120 .....	100	56.0	16.2	47.3	24.9	28.2	26.2	21.6			

by a number of specifically or subspecifically distinct forms. Among such relicts *E. alstoni* is one of the least modified, and appears to have its closest ally in *E. norvegicus*, the Skandinavian representative of the ancient type. The Raasay Bank-mouse carries the story a stage further. A careful analysis of the dental and cranial characters of all the available species of *Evotomys* recently made by one of us leaves no room for doubting that *E. alstoni* and *E. erica* are more nearly allied to each other than is either of them to any other known form. Of them, the former is the more primitive; the latter appears to have adapted itself to subsistence upon a coarser diet than that affected by most species of *Evotomys*. For this purpose the cheek-teeth have become larger and stronger; the muscles of the jaws have therefore acquired greater strength, and this in turn has, by demanding increased size and strength from those parts of the skull to which the muscles in question are attached, moulded the skull in a peculiar way. Thus the growth of the anterior part of the temporal muscle has caused more extensive constriction of the interorbital region, produced longer and more prominent postorbital crests, and stimulated growth of the upper border of the jugal. The increased development of the masseter has caused deepening of the rostrum, widening of the outer wall of the infraorbital canal, and expansion of the zygomata, in addition to the change in the angular process of the mandible described above. To the growth of the pterygoid internus is due the widening of the pterygoid fossæ and the narrowing of the interpterygoid space; further, because of this extension the eustachian tube, in order to keep in connection with the pharynx, has grown further forwards and inwards, and so has produced the change noted in the form of the bullæ.

*Microtus agrestis mial*, subsp. n.

*Hab.* EIGG, Inner Hebrides. "Not entirely nocturnal; common in big heather" (*Montague*).

*Material examined.* Ten collected by Mr. P. D. Montague. Dimensions:—

	Head and body.	Tail.	Hind foot.	Ear.
No. 63, male, 30th March, 1913.....	108	32	18	13
No. 66, " 31st " " .....	116	32	18·5	13
No. 75, " 7th April, " .....	108	34	18	13
No. 49, female, 29th March " .....	104	31	19·5	13
No. 50, " 28th " " .....	110	32	19	12
No. 51, " 29th " " .....	106	32	19	12·5
No. 62, " 30th " " .....	103	30	19	13
No. 64 (type), female, 30th March, 1913.	113	36	20	12
No. 65, " " " " .....	110	31	20	13
No. 67, " 31st " " .....	100	29	18	11·5



Nine collected by Mr. D. Anderson :—

		Head and body.	Tail.	Hind foot.	Ear.
No. 61, male,	13th June, 1913	.... 107	39	18	13
No. 63, "	16th " "	.... 115	35	18	13
No. 64, "	" " "	.... 110	31	17·5	12
No. 71, "	19th " "	.... 108	36	18	13
No. 72, male, juv.,	19th June, 1913..	98	27	18	10
No. 60, female,	13th June, 1913....	101	35	17	12
No. 62, "	" " "	.... 116	37	18	12
No. 68, "	18th " "	.... 116	38	19	13
No. 69, "	" " "	.... 112	37	17	12

Judging from the skulls the specimens range from immature to young adult. None are really old.

*External characters.* Having regard to the age of the specimens this new form agrees in size and proportions with *M. a. exsul*, from which, however, it differs strikingly in pelage. The general colour of the back is about as in *exsul*, but the rump and flanks are much darker; the underside and the posterior surface of each hind leg are silvery, in sharp contrast with the dark brown of the flanks and rump. Rarely the underside shows faint traces of a median stripe of yellowish wash. The fur is longer and rather coarser in texture than in *exsul*, giving the animal a shaggy instead of a sleek appearance; this and the darkening of the rump and flanks is due to the greater abundance and length of the black "bristle" hairs. These features are conspicuous in both vernal and æstival specimens.

*Dental and cranial characters.* In enamel-pattern the cheek-teeth of *mial* agree with those of *exsul*: in the nineteen cases examined only one was entirely without a trace of the fourth inner angle in *ch. t. 1*; in three this structure was represented merely by a microscopic vestige; in eleven it was small but quite distinct; and in four it was large and of regular form.

Nine skulls admit of detailed investigation: their condylo-basal lengths range between 25·4 and 27·4 mm., and the condition of their temporal ridges &c. is such as to indicate that, as in *exsul* and other subspecies of *agrestis*, the condylo-basal length in old specimens must amount to 28·5 mm. or more. Compared with skulls of *exsul* of equal age, that of *mial* agrees closely, differing only in having the nasals relatively a little shorter, the auditory bullæ slightly smaller, and the basioccipital, which, of course, is in close relation with the bullæ, slightly shorter. These differences are made clear in the following table:—

	<i>M. a. mial.</i>	<i>M. a. exsul.</i>
1. Condyllo-basal length.....	100	100
2. Nasal length .....	26·2-27·3	28·0-30·0
3. Distance between condyle and molars..	39·8-42·3	39·6-42·1
4.       "       "       "       anterior face of bulla.....	28·4-29·6	29·5-31·4
5. Median length of basioccipital.....	13·8-15·9	15·3-17·8

It is quite likely that when older skulls of *mial* come to hand further distinctions from *exsul* will be found; a suggestion of this is afforded by the skull of the type, which has the parietal region flatter than in any of the numerous skulls of *exsul* before us. For the cranial dimensions see table on p. 367.

*Remarks.* *M. a. mial* is to be regarded as a peripheral and local modification of *M. a. exsul*; in the Outer Hebrides the latter, so far as is known, shows no tendency to be differentiated into local races on the various islands which it inhabits.

### 3. *Microtus agrestis luch*, subsp. n.

*Hab.* MUCK, Inner Hebrides. "Very scarce; trapped in short heather on the edge of the cliff" (*Montague*).

*Material examined.* Three adults collected by Mr. P. D. Montague. Dimensions:—

	Head and body.	Tail.	Hind foot.	Ear.
No. 72, male, 4th April, 1913 .....	108	32	17·5	11·0
No. 74 (type), male, 5th April, 1913..	110	33	18	11·5
No. 73, female, 4th April, 1913 ....	105	33	18	11·0

In the skulls the temporal ridges are fused in the inter-orbital region, and these animals are at least nearly of full size.

*External characters.* Size smaller than in other subspecies of *agrestis*, nearly as in *M. hirtus*. The fur is dense and shaggy, rather like that of *mial*, although this character is less marked. The underside, including that of tail, has throughout a heavy wash of buff or yellow, darkened here and there by the slaty bases of the hairs. On the back the black "bristle" hairs are nearly as abundant and as long as in *mial*, and the colour is as dark as in the latter; laterally these hairs are fewer in number and shorter, so that the colour of the flanks is lighter than in the *Eigg* form, and it passes insensibly into the buff of the underside.

*Dental and cranial characters.* The cheek-teeth are normal; *ch. t. 1* has no trace of a fourth inner angle. Save for its

	Condylar-basal length.	Zygomatic breadth.	Interorbital constriction.	Mastoid breadth.	Occipital depth (median).	Nasal length.	Diastema.	Maxillary cheek-teeth (alveolar).	Mandible.	Mandibular cheek-teeth (alveolar).	Remarks.
<i>M. a. corsid.</i>											
N. Uist .....	26.4	15.2	3.1	11.4	6.2	7.6	7.6	6.3	16.5	6.1	Middle-aged.
S. Uist .....	27.4	15.9	3.2	11.9	6.6	8.2	7.5	6.6	17.4	6.3	"
Mull .....	28.6	16.2	3.4	12.5	7.1	8.4	8.1	6.9	17.6	6.8	Aged.
<i>M. a. macgillivrayi.</i>											
Islay .....	28.7	16.4	3.7	12.6	6.7	8.8	7.8	7.1	17.6	6.7	Aged. (Type.)
<i>M. a. nivalis</i> , Egg.											
No. 61 .....	27.4	15.7	3.5	11.8	6.3	7.2	7.8	6.4	17.9	6.3	Middle-aged. (Type.)
No. 62 .....	26.4	15.1	3.1	11.5	6.1	7.0	7.4	6.7	17.0	6.3	Young adult.
No. 66 .....	25.4	14.6	3.3	11.2	6.0	6.9	7.3	6.6	16.4	6.2	"
<i>M. a. neglectus.</i>											
Loch Awe .....	28.1	16.1	3.3	12.8	6.6	7.8	8.0	6.9	17.5	6.4	Aged.
<i>M. a. hutchinsii.</i>											
Much, No. 74 .....	26.0	15.5	3.0	11.8	6.6	7.2	7.2	6.3	16.8	6.1	Middle-aged or more.
<i>M. hirtus hirtus.</i>											
Surrey .....	25.3	14.6	3.2	11.8	7.0	7.1	7.2	6.4	15.8	6.1	Aged.

smaller size the skull cannot be distinguished from that of *M. a. neglectus*; it differs quite strikingly from the skull of *mial* in its smaller size, relatively greater zygomatic breadth, broader brain-case, and longer basioccipital (17.3 % of condylo-basal length). For the cranial dimensions see table on p. 367.

*Remarks.* This mouse is apparently a dwarfed insular development of *M. a. neglectus*, the form inhabiting the Scottish mainland. The presence of such an animal on Muck is the more interesting when we recall that on Eigg, as on Skye, Mull, Jura, Islay, Gigha, and Arran the grass-mice are either identical with *exsul* or more nearly related to it than to *neglectus*. It seems probable that Eigg and Muck have been separated from each other for a very long time and that Muck has been joined with the mainland at a more recent date than that of the severance of most of the other islands.

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XLIII.—*Descriptions and Records of Bees.*—LIV.

By T. D. A. COCKERELL, University of Colorado.

*Megachile vineta*, Vachal.

Two females from Guayaquil, Ecuador (*Buchwald*; Alfken coll. 1). Previously known only from Arica, Chili. In one the abdomen shows distinct green tints. The ventral scopa is clear white, with a little black hair at extreme apex.

*Megachile pyrrhogastra*, sp. n.

♀.—Length about  $12\frac{1}{2}$  mm.

Robust; head and thorax black, with long pale ochreous hair; abdomen bright ferruginous, the first segment above with ochreous hair, second to fifth with rather broad, entire, orange-fulvous hair-bands; ventral scopa white, scanty and fulvous on last segment; extreme sides of third and following segments with black hair, long and conspicuous, invading the scopa, on the fourth. Wings strongly reddish, with an orange tint. Legs black, the femora more or less stained with red. Mandibles broad, quadridentate; clypeus shining, strongly punctured, the lower margin with two tubercles close together; antennæ chestnut-red, dusky above; meso-thorax granular from very dense minute punctures; tegulae



ferruginous; hair of legs pale, ferruginous on inner side of the broad hind tarsi; spurs very pale reddish; apical tarsal joints ferruginous; claws simple; last dorsal abdominal segment straight in profile, with very fine and short appressed ochraceous hair, and some longer hairs; a few black hairs before the orange band on fifth segment.

*Hab.* Guayaquil, Ecuador (*Buchwald*; Alfken coll. 3).

Resembles *M. pulchra*, Smith, but differs in the colour of the legs and abdominal bands.

*Megachile pyrrhotricha*, sp. n.

♀.—Length about  $12\frac{1}{2}$  mm.

Robust; black, with the hind tarsi and small joints of the other tarsi rather obscure red. Wings rather dilute fuliginous; ventral scopa bright fox-red. Head broad; mandibles quadridentate; clypeus shining, strongly punctured, with a delicate median raised line, lower margin practically straight; cheeks and sides of face and front with conspicuous long white hair, vertex with black hair; antennae dark; mesothorax dull in front, but otherwise shining, with scattered punctures of different sizes, none large; middle of scutellum smooth and shining; a very little black hair on thorax above, but an erect tuft on tubercles; margins of mesothorax (including band in scutello-mesothoracic suture), and all of metathorax and pleurae with creamy-white hair; tegulae picous. Legs with pale hair, fox-red on inner side of hind tarsi; spurs very pale reddish; claws with a sub-basal tooth. Abdomen shining, finely punctured, with a faint greenish tint; first segment above with creamy-white hair, the others with pale fulvous hair-bands, more or less interrupted on the second; segments between the bands with scanty short black hair; last dorsal segment straight in profile, with very minute appressed fulvous hairs, and black bristles laterally.

*Hab.* Guayaquil, Ecuador, 2 ♀ (*Buchwald*; Alfken coll. 2).

Not unlike *M. chrysophila*, Ckll., but sculpture of scutellum wholly different.

*Megachile perochracea*, sp. n.

♀.—Length about 10 mm.

Robust; black, including the tarsi, mandibles obscurely reddish; hair of head and thorax above bright ochreous mixed with fuscous; hair of face (mixed with black on

clypeus), cheeks, pleuræ, and metathorax pale ochreous, becoming white on underside of thorax; first abdominal segment above with fulvous hair, brighter than the ochreous bands on the second to fifth segments; sides of third and following segments with long black hair; ventral scopa creamy white, with black hair only at extreme sides; tegule reddish ochraceous, with a fuscous spot. Wings dusky. Head very broad; mandibles obscurely quadridentate; clypeus shining, well punctured, with a median ridge, the lower margin gently concave in the middle; antennæ dark; mesothorax and scutellum dull, densely granular-punctate; a broad fulvous hair-band in scutello-mesothoracic suture. Legs with pale hair, ferruginous on inner side of tarsi; hind basitarsi broad; claws simple; black hair between the abdominal bands extremely short; left dorsal segment in profile slightly concave, with short ochraceous tomentum and small dark bristles.

*Hab.* Guayaquil, Ecuador, 3 ♀ (*Buchwald*; Alfken coll. 5).

Very like *M. permunda*, Ckll., only known in the male, but that Brazilian species has red legs. It is superficially rather like *M. lenticula*, Vach., but the sculpture of the mesothorax is entirely different.

*Megachile portalis*, sp. n.

♀.—Length a little over 10 mm.

Robust; black, with the dorsal hair cream-coloured or very pale ochreous and black, the other hair white; abdominal bands very narrow, entire; black hair at sides of abdomen, but ventral scopa white, black on last segment except basally. Wings strongly dusky; tegulæ piceous. Eyes converging below; clypeus densely punctured, lower margin gently concave in middle. Antennæ slender, flagellum obscure reddish beneath; face and cheeks with white hair (thin on clypeus), vertex with black; mesothorax and scutellum dull, densely and finely punctured; a pale hair-band in scutello-mesothoracic suture. Legs with pale hair, ferruginous on inner side of tarsi; claws simple; last dorsal segment straight in profile, with appressed ochreous tomentum and small black bristles.

*Hab.* Guayaquil, Ecuador, 2 ♀ (*Buchwald*; Alfken coll. 4).

Close to *M. perochracea*, but the pubescence is differently coloured and the clypeus has no median ridge.

The following table will readily separate the above species :—

Abdomen red .....	<i>pyrrhogastra</i> , Ckll.
Abdomen dark .....	1.
1. Ventral scopa red .....	<i>pyrrhotricha</i> , Ckll.
Ventral scopa not red .....	2.
2. Thorax above with hair all black .....	<i>vineta</i> , Vachal.
Thorax above with hair not all black .....	3.
3. First abdominal segment with bright ochreous or fulvous hair; clypeus with a median ridge..	<i>perochracea</i> , Ckll.
Without these characters .....	<i>portalis</i> , Ckll.

*Megachile kashgarensis*, sp. n.

♀.—Length  $13\frac{1}{2}$  mm.

Very robust; black, with ochraceous pubescence; vertex and discs of mesothorax and scutellum with dark chocolate-coloured hair; head as broad as thorax; antennæ dark; mandibles with the long cutting-edge very oblique, with four well-defined subequal teeth; clypeus coarsely and extremely densely punctured, with a shining median line, lower margin straight, faintly trituberculate; face with abundant pale ochraceous hair; mesothorax with the sides densely rugoso-punctate, but the disc shining, with large well-separated punctures; scutellum densely punctured; no conspicuous hair-bands on thorax; tegulæ piccous, with broad pale rufous margins. Wings hyaline, slightly dusky; b. n. falling short of t. m. Legs black, with pale hair, ferruginous on inner side of tarsi; hind basitarsi broad; anterior tibiae with a fringe of long hair behind. Abdomen hairy and with narrow, well-defined, entire bands on all the segments except the last; second to fourth segments with ochreous hair covering part before the bands, but fifth and sixth segments show black hair, and fourth a little black just before the band; apical segment in profile a little concave, with black and pale erect hair; ventral scopa pale fulvous, white at base, not at all black at apex.

*Hab.* Kashgar, Chinese Turkestan, Aug. 27, 1893 (*M. L. Abbott*). U.S. National Museum.

Very similar to *M. lagopoda* (L.), but with much less black hair on the apical part of the abdomen, and thicker, more conspicuous abdominal bands. The hind basitarsus is considerably broader in *M. lagopoda*. Judging from the description, *M. rescinda*, Smith, may also be similar, but it is said to have tridentate mandibles, and no dark hair is mentioned on head and thorax above. *M. kashgarensis* may,

perhaps, be a desert subspecies of *lagopoda*; it certainly differs from the three species of the *lagopoda* group described by Morawitz.

*Melipona orbigny*, Guér.

Strand (Zool. Jahrb. 1910, p. 556) has discussed this species, indicating the confusion which has arisen regarding it. I have a male, which appears to be quite correctly determined, from F. Smith's collection. I have also before me two workers from Rosario, Argentina (Alfken coll. 33); they differ from the male by the black clypeus, with a little reddish around the edges, and the black hair of vertex, cheeks, and legs. These workers are easily distinguished from those of *M. quinquefasciata*, Lep., from Asuncion, Paraguay (*Schrottky*), by the black hair just mentioned, the lack of a clypeal stripe and of lateral face-marks, and the very broadly interrupted band on first abdominal segment.

*Mesocheira bicolor* (Fabr.).

Three from Guayaquil, Ecuador (*v. Buchwald*; Alfken coll. 11), represent a variety with the abdomen green, varying from yellowish green to peacock-green. The variety *elizabethæ*, Ckll., from the mountains of Ecuador, is not precisely the same, but I now doubt whether it represents a distinct geographical race.

*Mesoplia decorata* (Smith).

Guayaquil, Ecuador (*v. Buchwald*; Alfken coll. 34). Described from Brazil.

*Tripeolus buchwaldi* (Fricse).

Guayaquil, Ecuador, 1 ♂, 1 ♀ (*v. Buchwald*; Alfken coll. 12).

The *Epœolus buchwaldi*, Friese, is a typical member of the North-American genus *Tripeolus*. It is very similar to *T. sublunatus*, Ckll.

*Crocisa lamprosoma*, Boisduval.

New South Wales (Nat. Mus. Victoria, 119): "presented by B. F. Hill, Windsor, 12. 97" (Nat. Mus. Vict. 120).

I am not quite sure whether the specimen last cited was collected at Windsor or not; some of the labels from the Victorian Museum seem to refer to the residence of the



donor and the date of the donation, confusing information of no scientific value. I also learn from Mr. Froggatt that there may be doubt about some of the localities of the bees he received from Melbourn, many of which I have recorded, crediting their capture to Mr. French. Mr. Froggatt ascertained that the bees were bought from a collector "who named them where he pinned them, so the localities, unless verified, are not reliable." In future, when I have occasion to refer to bees of this lot, I shall cite the data on the labels, but within quotation marks.

*Crocisa waroonensis*, Cockerell.

Waroon, W.A. (*G. F. Berthoud*).

Marked nearly as in *lamprosoma*, but all the markings white; anterior part of mesothorax with long white hair; wings with a little more than the basal half clear hyaline, the apical half fuscous, with the usual spots.

*Parasphecodes excultus*, Cockerell.

Magnet, Tasmania (*Lea*).

Female not unlike *P. speculiferus*, Ckll., but tegulae rufous; posterior disc of mesothorax shining, with well-separated punctures; area of metathorax much shorter; abdomen with only segments 2 and 3 and apical half of first red.

*Paracolletes lei*, Cockerell.

Ulverstone, Tasmania (*Lea*).

Female about  $11\frac{1}{2}$  mm. long, rather slender; shining black; clypeus strongly punctured and with a median ridge; mesothorax sparsely punctured; hind tibial scopa large, creamy white, stained with fuscous behind.

Full descriptions of the above three species will be found in Proc. Linn. Soc. New South Wales.

*Anthoglossa hackeri*, sp. n.

♀.—Length 14 mm.

Robust; black, the hind margins of abdominal segments with the tegument broadly shining orange-golden; wings strongly dusky; antennae and legs black. Head very broad; clypeus shining, with strong scattered punctures; hair of head and thorax white on sides and below, white also on face and occiput, but dark sooty on vertex and dorsum of thorax, also just below wings, and on upper part of sides of metathorax; mesothorax and scutellum dull; b.n. falling

short of t.-m.; second s.m. very broad, receiving first r. n. in middle; tegulae black; hair of femora white, of tibiae and tarsi black; on inner side of anterior tarsi the hair is ferruginous; abdomen, except for the bands, dull and black, with no punctures and no distinct hair-bands; caudal fimbria dark sooty; ventral segments fringed with white hair.

*Hab.* Tambourine Mountain, Queensland, Oct. 27, 1912 (*H. Hacker*). Queensl. Museum 76.

A very beautiful species, structurally like *A. aureotincta*, Ckll., but differing by the absence of a band on first abdominal segment, the dark hair of upper part of head, and the dusky wings.

*Trichocolletes venustus* (Smith).

Oakleigh, 1894 (*B. F. Hill*; Nat. Mus. Vict. 110).

*Paracolletes megachalceus*, sp. n.

♀.—Length about 14 mm.

Robust; head and thorax black, densely hairy; abdomen brassy green, the hind margins of second and following segments broadly pale reddish; postscutellum with a median tubercle. Wings dusky hyaline, nervures ferruginous, b. n. falling just short of t.-m.; second s.m. broad, receiving first r. n. some distance before middle; third s.m. receiving second r. n. very near end. Head very broad; clypeus shining, strongly punctured; flagellum red at apex and far toward base beneath; hair of face, cheeks, pleura, and occiput dull white, of front pale fulvous, of vertex purplish fuscous, of thorax above (also just below wings) dense and very bright rufo-fulvous; disc of mesothorax shining, with scattered punctures, but in front the mesothorax is more closely punctured; tegulae bright orange-ferruginous. Legs red, more or less clouded with dusky, their hair mainly pale, but fuscous on outer side of middle and hind tibiae and tarsi; hind tibial scopa very large and loose, beautifully plumose, anteriorly white, fuscous behind, the tibia on inner side with appressed light fulvous hair. Abdomen with much fulvous hair, but no hair-bands; hair of fifth segment bright red, but of sixth more sooty; venter with cream-coloured hair.

*Hab.* Clarence River, New South Wales (*Wilson*; Nat. Mus. Vict. 124).

A very fine species, structurally related to *P. dentiger*, Ckll., but larger, more robust, and quite differently coloured.

*Paracolletes fimbriatus*, Cockerell.

Two males from Victoria Museum ; New South Wales (123) and no locality (112).

*Paracolletes megadontus*, sp. n.

♀.—Length 10 mm.

Head, thorax, and abdomen steel-blue, with greenish tints, strongly punctured ; postsentellum with a very prominent tooth ; antennæ dark, flagellum reddish at end ; pubescence black and white ; caudal fimbria dense and black, but a tuft of white hair on each side of abdomen subapically. Wings dusky hyaline ; sides of front with very strongly marked black foveal depressions, which at the upper end almost touch lateral ocelli.

Very near to *P. dentiger*, Ckll., differing as follows:—Smaller ; the thin hair of clypeus white ; area of metathorax smooth and shining, without transverse striæ ; second s.m. receiving first r. n. before the middle, but not near base ; third s.m. receiving second r. n. much nearer apex ; hind legs not metallic ; hair on outer side of tarsi and of middle tibiae black, also black on inner side of tarsi ; hind tibial scopa bicoloured, white and black ; abdomen shining and finely punctured.

Also very close to *P. cæruleotinctus*, Ckll., which is known only in the male ; but from the entirely different colour of hair of head and thorax and the prominent postscutellar spine (male *cæruleotinctus* has a slight prominence, not amounting to a tooth or spine), as well as the darker venation, it can hardly be the opposite sex of that species.

*Hab.* Calowadra, Queensland, Oct. 30, 1912 (*H. Hacker* ; Queensl. Mus. 81).

*Andrena (Trachandrena) prunicola*, sp. n.

♀.—Length 10 mm.

Black, with greyish-white pubescence ; hind tibiae and tarsi clear ferruginous ; middle tarsi dark reddish ; facial quadrangle a little broader than long ; process of labrum broad, truncate ; clypeus shining, strongly and closely punctured, without a smooth line ; facial foveæ brownish white, rather narrow, tapering below to a point about level with middle of supraclypeal area, not widely separated from eye ; supraclypeal area densely punctured, the punctures much smaller than those of clypeus ; flagellum obscurely reddish beneath toward end ; third antennal joint a little

shorter than next two combined; mesothorax shining, with strong scattered punctures; mesopleura dull, strongly and closely punctured; area of metathorax semilunar, sharply defined behind, with fine weak ridges, the sculpture unusually fine for a *Trachandrena*; tegulae dark reddish. Wings reddish hyaline; nervures and the large stigma chestnut-red; b. n. meeting t.-m., second s.m. receiving first r.n. beyond middle. Hair of legs pale; scape of hind tibia rather small, white. Abdomen shining, strongly punctured, second segment in middle depressed a little less than half; white hair-bands at sides of second segment, on third except in middle, and right across fourth; hair at apex of abdomen pale fulvous.

*Hab.* Beulah, New Mexico (Canadian Zone), at flowers of wild plum, May 30 (*Wilmatte Porter*).

On account of the weak sculpture of the metathoracic area this resembles *A. radiatula*, Ckll., but that species has the second abdominal segment depressed more than half, and the hind tibiae and tarsi are not ferruginous.

*Andrena argentinæ*, var. *trichomelana*, v. n.

♂.—Hair of face entirely black; of cheeks, legs, and sides and venter of abdomen mainly black or sooty.

♀.—Hair of face entirely black.

*Hab.* Florissant, Colorado, 2 ♂ (one of them the type) and 1 ♀ at flowers of *Salix brachycarpa*; 1 ♂ at flowers of *Ribes vallicola*, June 10, 1907. All collected by S. A. Rohwer.

*A. argentinæ* was described as *A. vicina argentinæ*, Ckll., but it is probably a distinct species.

At Longs Peak Inn, Colorado, alt. 8956 ft., June 25 and 26, 1913, I took *Andrena mariæ*, Rob., *A. tacitula*, Ckll., *A. cyanophila*, Ckll., and *A. medionitens*, Ckll. These records are of interest on account of the altitude.

XLIV.—*Thaumastotherium osborni*, a new Genus of *Perissodactyles* from the Upper Oligocene Deposits of the Bugti Hills of Baluchistan.—*Preliminary Notice*. By C. FORSTER-COOPER, M.A., University Demonstrator in Comparative Morphology, Cambridge.

DURING an expedition to Baluchistan in 1911 I found, among other fossils, a mammalian atlas and dorsal vertebra remarkable for their unusually large size. These I suggested



might have belonged to an animal whose lower jaws were obtained at the same time, and which were made \* the type of a new genus and species, *Paraceratherium bugtiense*.

On a second expedition to the same locality, made the following year, the skull belonging to these same jaws was discovered, which shows clearly enough that the association of jaws and vertebræ was erroneous, the condyles of the skull being far too small for the atlas.

At the same time three other cervical vertebræ of correspondingly large size were brought to light, and with them a femur, tibia, part of an ulna, two humeri, and several foot-bones.

These fragments point to the presence in these deposits of an animal, apparently a Perissodactyle, of such unusual size and shape as to require a new genus for its reception. For the atlas, therefore, and for the bones associated with it, I propose the generic and specific names *Thaumastotherium osborni* †.

The measurements of the various bones are as follows:—

- (1) A left astragalus (fig. 1), Perissodactyle in general form, measuring 18 cm. across the trochlear surface; the edges of this surface are rather rounded as compared with the sharper edges found in the corresponding bone of the Rhinoceros.
- (2) A lateral podial bone (fig. 2) 37.5 cm. in length. A second bone which awaits development from its matrix is somewhat larger and has an apparent length of 44 cm.
- (3) The femur, a strong pillar-like bone, having the head in line with the shaft, is 114 cm. long and 19 cm. across the condyles. There is no trace of a third trochanter.
- (4) The humeri are 85 cm. long, 24 cm. across the lower articular surfaces, 30 cm. across the supra-condylar ridges, the head being 24 cm. from side to side and 19 cm. from front to back.
- (5) The atlas (fig. 3) is 47.5 cm. in extreme width from wing to wing, 24 cm. in depth of wing, and with a condylar surface of 27.4 cm.

\* Ann. & Mag. Nat. Hist. ser. 8, vol. viii. p. 711 (1911).

† In naming this animal I take this, my first opportunity of expressing my gratitude to Professor Henry Fairfield Osborn, President of the American Museum of Natural History of New York, not only for the benefit of a year's training under his guidance, but for his continued interest since that time. I should also like to record at the same time my obligations to his colleagues at the museum for many friendly acts, particularly Mr. Walter Granger and Dr. W. K. Gregory.

- (6) An anterior cervical vertebra (fig. 4, side view) of square shape, measuring 30 cm. in length along the centrum and 33 cm. across the widest part. In shape it corresponds roughly with the anterior vertebræ of the

Fig. 1.

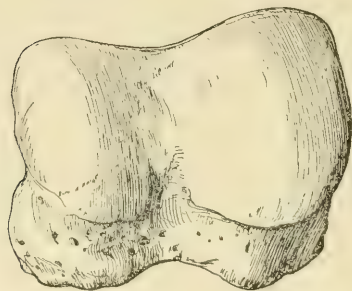


Fig. 2.



Fig. 3.

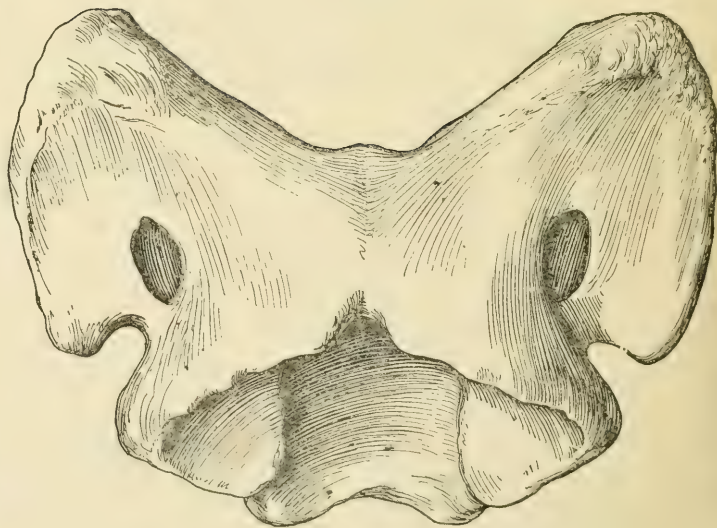


Fig. 4.



Fig. 5.

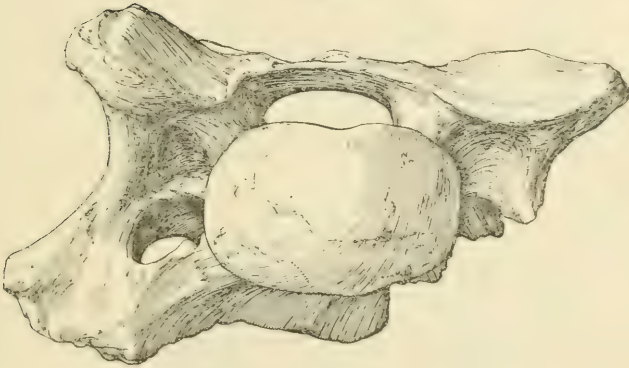
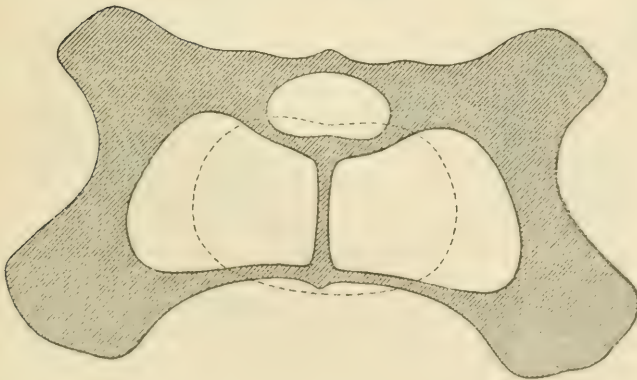


Fig. 6.

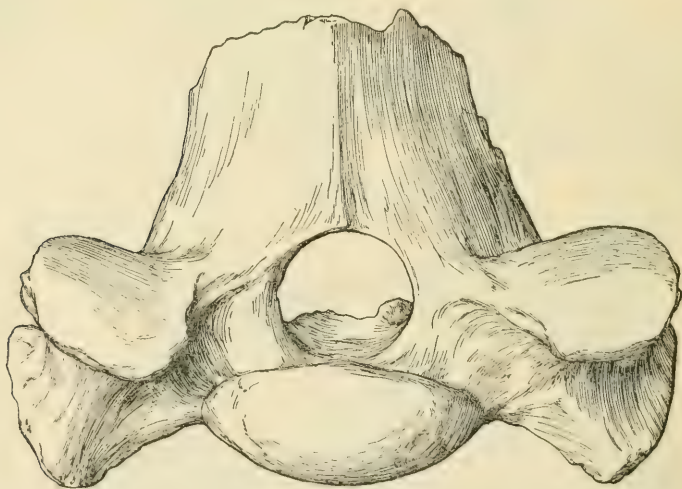


horse. The dorsal and ventral ridges are but little marked. The vertebrarterial canal is very large and shows a peculiar feature in the way it excavates the centrum. This modification is also shown by the atlas, and still better in the following vertebra, which is

- (7) A later cervical (fig. 5, front view). This bone differs from that just described in having a less great fore-and-aft depth, the proportions being otherwise much the same. One side being broken away, it has been possible to trace out the course of the vertebrarterial canal, which shows a very curious feature in expanding into a large "cave" in the body of the vertebra to such an extent that the bone between the expansions of each side is reduced to a thin vertical partition running the length of the bone. This structure is shown in the accompanying diagram, which is a plan of a section taken transversely through the vertebra.

Another similar vertebra, which is in process of being prepared, shows the same feature, probably a method of saving weight.

Fig. 7.



- (8) The remaining vertebra (fig. 7) is apparently an anterior thoracic. It measures 42 cm. in width across the posterior zygapophyses. The neural spine is rather peculiar in being very broad and flat, the upper border of the spine is broken away, but it does not seem to have been very much higher.



As some of the bones are not yet fully developed, a further description cannot be attempted here. In fact, there is some difficulty in finding material for the purposes of comparison, owing to the aberrant character of the bones. The astragalus, as may be seen from the figure, is Perissodactyle rather than anything else—at all events, it is not Proboscidian; moreover, it (as well as the other foot-bones, of which there are a considerable number) is more comparable with those of the Rhinoceros than anything else, in spite of great differences in proportion and size. The two podial bones point to an animal exceedingly dolichopodous, a remarkable feature when the heavy build of the body is taken into consideration.

The femur and humerus are rather Proboscidian at first sight, and are probably thus modified in each case as adaptations to weight-carrying. The absence of a third trochanter does not necessarily imply that the owner is not a Perissodactyle, seeing that the Titanotheres were without one.

It is the vertebrae, however, which show this animal in the strangest light, for, in addition to the unique structure of the vertebrarterial canal described above, the shape and measurements of the bones themselves point to a very long neck. At the end of this long neck there must have been a very large skull, witness the size of the condylar facets in the atlas. It is very unfortunate that no trace of this skull could be found to give us an idea of its shape; but if we take the length of the skull as about four times the width of the condyles (a proportion found in some of the rhinoceroses), we get a head measuring well over a yard in length. The weight of a mass like this at the end of a four-foot neck (a moderate estimate) would require and account for some strange modifications of the cervical vertebrae.

It is thus impossible at present to give an idea of the position of this animal. I believe all the bones described to belong to one animal both from their close association in the bone-bed and from the universal absence in these deposits of a trace of any other form to which they could belong. The Elephants and Rhinoceroses living at the same time, of which considerable remains have been found, point to forms of small or not more than medium size (*Paraceratherium bugtiense*, the next largest animal obtained, is about as large as a modern rhinoceros).

It is to be hoped, however, that a stricter examination and comparison of all the available material will throw some more light on the structure and relationships of this interesting form.

XLV.—*Notes on Actinostola callosa* (Verrill) = *Dysactis crassicornis* (Hertwig). By OLWEN M. REES, B.Sc., U.C.W. Aberystwyth.

THIS Actinian was described by Hertwig in [2] as *Dysactis crassicornis* of the genus *Dysactis* (Milne-Edwards). It is also described by McMurrich as *Actinostola callosa* (Verrill). McMurrich obtained his specimen from off the coast of Ecuador, South America. Hertwig obtained his from the southern shores of America, 53° 38' S., 70° 56' W.

A specimen was collected by Mr. R. Vallentin, of Falmouth, during his visit to the Falkland Islands, and recently sent by him to Mr. C. L. Walton, who very kindly passed it on to me for examination. It was picked up on the 5th Sept., 1910, adhering to a root of *Lessonia*, during an onshore gale (S.W.) in King George's Bay, W. Falkland Islands.

*External Characters of Actinostola callosa.*

This specimen was in a state of contraction, yet all the tentacles were in full view, probably because the sphincter muscle was still expanded. The column is pillar-like, low, and broad, with the diameter exceeding the height. Height 11 mm., diameter of tentacular crown 16 mm., diameter of pedal disc 20 mm. The column-wall is firm and leathery and variously corrugated, owing to contraction. The margin is tentacular. The base is adherent, undulate in outline, and exceeding the column. The oral disk is concave, having the mouth raised on a cone. The diameter of the mouth is 7 mm. The oral fissure is bounded by swelling papillæ, of which two at either end enclose the entrance to the œsophageal grooves.

The tentacles are very numerous, and cover the whole of the disk. The tentacles lying towards the outside become shorter and also more slender than those near the mouth. The outermost tentacles are so small that they merely project as small knobs above the surface of the oral disk.

Length of tentacle of outer cycle is 1 mm.; length of tentacle from the innermost cycle is 3 mm.

They are arranged in five cycles: 12 + 12 + 24 + 48 + 96. There is a distinct orifice at the tip of each tentacle. The tentacles have no markings, but the outer ones are paler in colour than the inner.

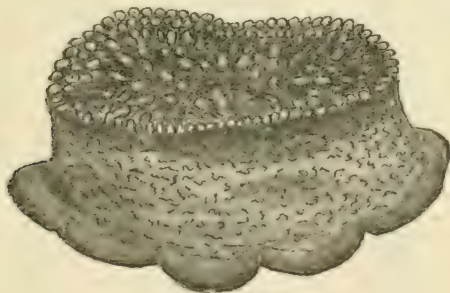
The colour of the body-wall is brick-red, the tentacles being of a paler hue with a deep dark band around the summit of the column.

*Internal Characters.*

There is a diffuse mesoglœal sphincter muscle extending a considerable way down the body-wall. It does not expand suddenly, but is largest in the middle region and tapers off very gradually as it is traced downwards. It does not occupy the entire width of the column-wall, but lies throughout its course nearer the endodermal surface than the ectodermal. On its inner surface its cavities pass directly into the ordinary longitudinal muscle of the mesoglœa of the column-wall. The sphincter muscle in cross-section appears as a network of fibrillæ, and the spaces between the fibrous meshes appear empty. [In spirit.]

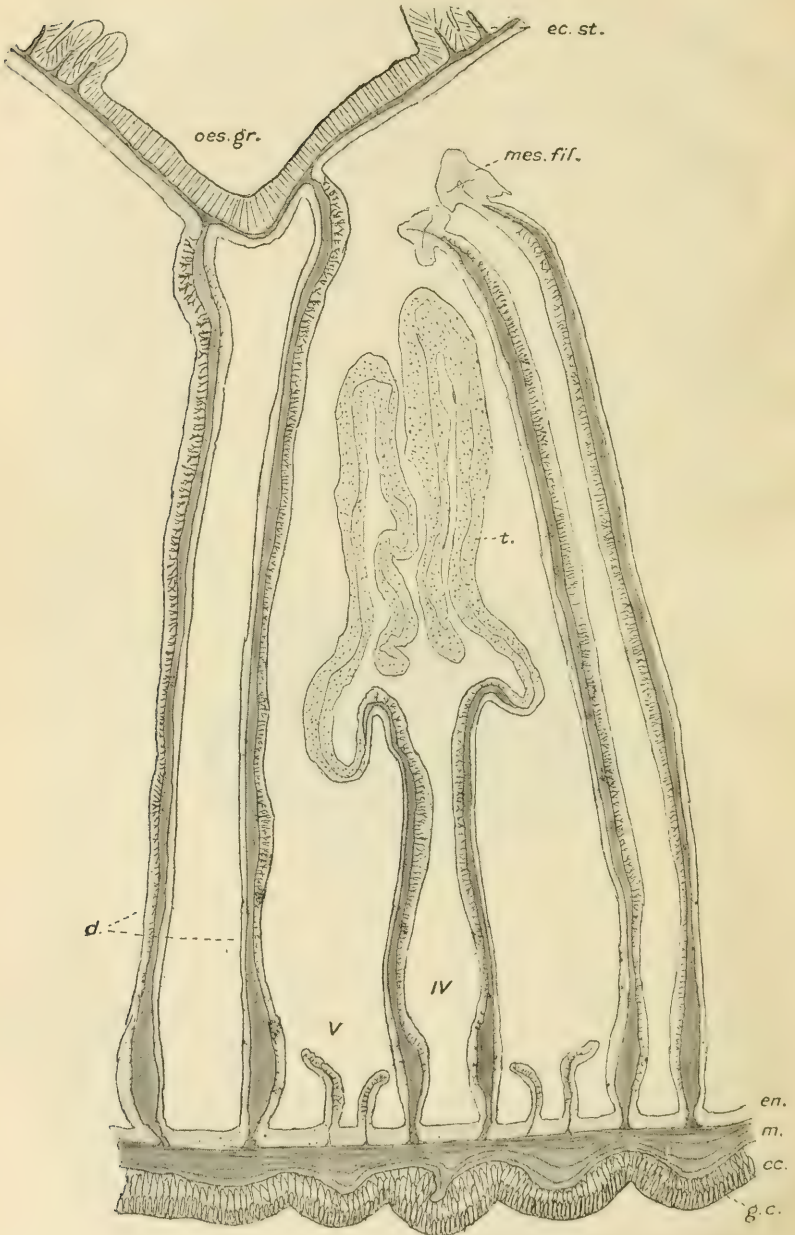
In the living animal these spaces are filled with the protoplasm and the nuclei of the muscular corpuscles. There is also a tendency for these closely packed cavities to be arranged in longitudinal bands separated from one another by strands of nearly homogeneous mesoglœa, recalling the arrangement described by Hertwig and McMurrich.

Fig. 1.

Falkland specimen of *Actinostola callosa*.

The number of septa is large. They amount to ninety-six pairs, which are distributed in five cycles. Twenty-four pairs reach the stomatodæum to a less extent than the other twelve. In addition to these, there is another cycle of twenty-four imperfect pairs—this is the fourth cycle; while the fifth cycle of forty-eight pairs consists of imperfect mesenteries which are very small and project only a short distance beyond the endoderm. They bear neither reproductive organs nor mesenterial filaments, but of each pair one mesentery is more highly developed than its fellow. This specimen is a male, and the testes are borne on all the

Fig. 2.



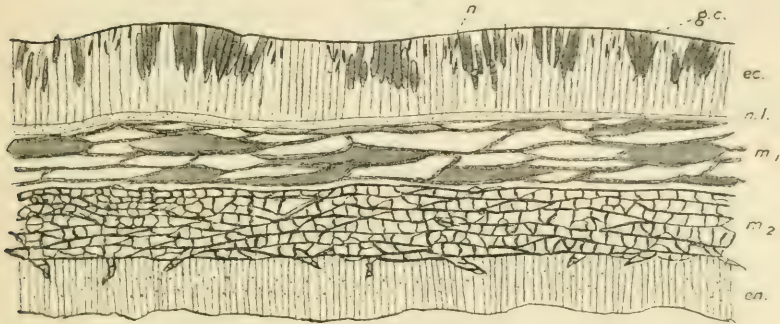
Portion of a transverse section through the mesenteries, showing one pair of directives.



mesenteries of the fourth cycle. The mesenteries are therefore arranged in five cycles, thus:—6 + 6 + 12 + 24 + 48.

The musculature of the mesenteries is not very strongly developed. There is a fairly distinct parieto-basilar muscle, which, on its distal end, is continued into a slender elongated longitudinal muscle. The muscle-folds are not numerous. They are slender, swollen at the tips, and sometimes divided. The ectoderm of the column-wall is thick, and contains numerous large yellowish gland-cells. The mesogloea is

Fig. 3.



Portion of a transverse section through the oral disc, showing two layers of muscles.

*Index to lettering.*

- d.*, directive mesenteries.
- ec.*, ectoderm.
- en.*, endoderm.
- oes.gr.*, oesophageal groove.
- ec.st.*, ectoderm lining the stomatodæum.
- mes.fil.*, mesenteric filament.
- g.c.*, gland-cells.
- m<sub>1</sub>*, upper layer of muscle.
- m<sub>2</sub>*, lower layer of muscle.
- n.*, nematocysts.
- n.l.*, nerve-layer.

strong, becoming fibrous towards the inner surface. On its outer surface it is raised into lobes, and these are covered with ectoderm. These account for the wrinkled appearance of the exterior of the animal. The ectoderm lining the stomatodæum is much folded, and its cells form a spongy mass. The mesogloea is dense and thin, sending out pointed projections into the ectoderm. The mesogloea of the tentacles is also very thin and, in longitudinal sections, is seen as a uniform layer reaching the base of the tentacle without giving

off any muscle-folds. The ectoderm of the tentacle is very thick and uniform, with very numerous nematocysts and with a definite nerve-layer lining its inner surface. The nerve-layer is clear and wide around the tip, becoming narrower near the base. The endoderm is very thin, and here also are numerous nematocysts. The ectoderm of the oral disk shows a few small nematocysts and gland-cells, and has a definite nerve-layer at the base of its cells. The mesogloea is peculiar, being divided into two layers. The upper consists of a network of elongated fibres, the section having been cut parallel to the muscle-strands. The other layer shows a series of much denser fibres with small cavities, this being a cross-section of the muscle. In each case the fibres are arranged parallel to the surface of the oral disk. We thus have two layers of muscles, running practically at right angles to one another and parallel to the surface of the disk.

This specimen is found to possess nearly all the characters described by McMurrich for *Actinostola callosa* and by Hertwig for *Dysactis crassicornis*. My specimen, however, is much smaller in size than any of those previously described. McMurrich mentions in *Actinostola callosa* the beginning of a sixth cycle of mesenteries, and also showing gonads on the mesenteries of the fifth cycle.

In the Falkland specimen the mesenteries of the fifth cycle are still very small, and there are no traces of any mesenteries arising to form a sixth cycle: this being probably due to the fact that the specimen is a young one. McMurrich, in his generic definition, says: "The tentacles are short and stout, fluted, and with their longitudinal musculature embedded in the mesogloea." Hertwig also, in his 'Supplement to Actinariae,' says that the tentacles are fluted.

The Falkland specimen shows no fluting either in preserved specimen or in transverse section. On comparing the figures of transverse sections of tentacles drawn by Hertwig for *Dysactis crassicornis* and by McMurrich for *Actinostola callosa*, it is seen that Hertwig shows a definite series of furrows, and even the mesogloea is distinctly corrugated; whereas in McMurrich's figure there is only a slight folding of the ectoderm. Thus the fluting on the tentacles is a variable character, dependent on the age and state of contraction of the animal. There is also a difference in the musculature of the oral disk of this Falkland specimen as compared with that of Hertwig's specimens. Hertwig found no indications of the presence of two sets of muscle-fibres. This character, however, is not of sufficient specific importance to be of any weight in deciding the identity of the specimen.

The species *Actinostola callosa* was first established by Verrill. Hertwig, however, in 1876, described specimens as *Dysactis crassicornis*. At first it was doubtful as to whether *Actinostola callosa* was identical with *Dysactis crassicornis* or not; but in 1888 McMurrich described a specimen as *A. callosa*, and found that it possessed many important characters described for *D. crassicornis*. He therefore proved that his specimen was identical with Hertwig's *Dysactis crassicornis*, but ultimately decided to adopt Verrill's name in its entirety and call it *Actinostola callosa*. This Falkland specimen, possessing important characters common to both McMurrich's *Actinostola* and to Hertwig's *Dysactis crassicornis*, proves further that these forms belong to the same species.

(I should like to thank Mr. F. S. Wright of this College for his help in preparing fig. 1.)

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- [1] Report on Actiniae collected by United States Fish Commission Steamer 'Albatross' during Winter 1887-1888. By J. P. McMURRICH.
- [2] Report on Scientific Results of Voyage of the 'Challenger,' 1873-1876. Vol. vi. Actinaria. By R. HERTWIG.
- [3] Report on Scientific Results of Voyage of the 'Challenger,' 1873-1876. Vol. xxvi. Supplement to Actinaria. By R. HERTWIG.

## XLVI.—*A new Species of Dwarf Potto.*

By OLDFIELD THOMAS.

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### *Arctocebus ruficeps*, sp. n.

Near *A. aureus*, but the body speckled grey-brown instead of rufous.

General characters as in *A. aureus*, agreeing with that species in all the points in which it differs from *A. calabarensis*. Fur thick, close, and woolly. Head golden rufous, as in *A. aureus*, though a little darker, but the body, instead of being also uniformly rufous, is a dark grizzled greyish-brown colour, more like some of the ordinary Pottos. Of the wool-hairs the basal three-fourths are slaty, the ends being brown ("snuff-brown," Ridgway). The longer hairs have a subterminal band of black, their tips being white, these giving a speckled appearance to the general colour.

Under surface essentially as in *A. aureus*, but the grey bases of the hairs more extended, so that the general colour is darker, and there are not even the whitish patches on the throat and inguinal region. Limbs bright rich rufous. Tail dark rufous, a small brown spot at the end of its terminal hairs.

Skull essentially as in *A. aureus*. Nasals comparatively short, ending posteriorly opposite the lacrymal foramina. Upper incisors narrow and far apart, as in *A. aureus*, as compared to the somewhat broader ones of *A. calabarensis*. Posterior premolars without any trace of the distinct hypocone present in the type of *A. aureus*, but with only one specimen of each species available no opinion can be expressed as to the validity of the character.

Dimensions of the type-skull (somewhat immature):—

Greatest length 50 mm.; condylo-basal length 47·5; greatest breadth 27·2; nasals 10·6; interorbital breadth 5; mastoid breadth 26·5; palatal length 20; front of canine to back of  $m^3$  17.

*Hab.* Metet, near the Nyong R., S. Cameroons.

*Type.* Subadult female. B.M. no. 13. 9. 12. 1. Original number 645. Collected 17th January, 1913, by Mr. G. L. Bates.

"Caught near Metet and brought to me alive. It died on the journey, and was skinned."—*G. L. B.*

This pretty little Potto is evidently most closely allied to *A. aureus*, also discovered by Mr. Bates, but differs by its darker and grey-grizzled upper surface, the darker colour of its belly, and (if a permanent character) by the absence of a hypocone on its posterior premolars.

From *A. calabarensis*, like *A. aureus*, it differs by its more lightly built skull, its slender incisors more widely separated mesially, its swollen teeth, and compressed lower premolars.

XLVII. — *British Fossil Crinoids.* — IX. *Cydonocrinus parvulus*, *n. g. et sp.*, *Yoredale Beds, Yorkshire.* By F. A. BATHER, F.R.S.

(Published by permission of the Trustees of the British Museum.)

THE specimen which it is the object of this paper to describe belongs to the Crinoidea Dicyclia Flexibilia, and, with all the Palaeozoic members of that Order, it falls into the Grade Impinnata. More precisely, it is one of the Taxocrinidae;



but here we must pause to consider what that statement means.

In 1900 (Lankester's 'Zoology,' vol. iii.) I divided the Flexibilia Impinnata into the families Ichthyocrinidæ, Taxocrinidæ, Dactylocrinidæ, Sagenocrinidæ, and the doubtful Gazacrinidæ. Omitting the last-mentioned, Dr. F. Springer (Oct. 1906, Journ. Geol. vol. xiv. p. 516) adopts an arrangement of genera based on essentially the same principles, which his increased knowledge has enabled him to render more precise and to apply with greater correctness. The chief difference of principle is the division of the genera according as the anals are united with the adjacent rays by direct suture or by finely plated integument (perisome). Further, Dr. Springer attaches rather less importance to the mode of arm-branching, and lays greater stress on the number of primibrachs. The increase of knowledge is mainly as regards the anal plates.

Thus, in the Family Taxocrinidæ Dr. Springer now includes several genera with heterotomous, ramuliferous arms, which I placed in the Dactylocrinidæ. On the other hand, he transfers *Anisocrinus* and *Homalocrinus* from the Taxocrinidæ, with *Calpocrinus*, *Lithocrinus*, and *Dactylocrinus* from the Dactylocrinidæ, to the Family Sagenocrinidæ, which thus becomes a trifle unwieldy, not to say heterogeneous.

I am prepared to adopt the mode of union of the anal series with the rays as a basis of classification, and therefore agree in restricting the Taxocrinidæ to genera that have the anal plates more or less separated from the adjacent rays by perisome. But it still seems to me convenient to exclude from that Family the genera with heterotomous arms. I would therefore suggest the following diagnosis:—

#### Family Taxocrinidæ.

Impinnata with anal plates forming a well-defined vertical series more or less separated from the adjacent rays by perisome; with isotomous arms, which may abut but do not interlock, and are generally divergent; with few interbrachials.

The genera are (a) those with a radianal, viz.:

*Protaxocrinus* Springer, genotype *P. ovalis* (Ang., s. *Taxocrinus*).

*Gnorimocrinus* W. & Sp., genotype *G. expansus* (Ang., s. *Taxocrinus*).

*Meristocrinus* Springer, genotype *M. loveni* (W. & Sp., s. *Gnorimocrinus*).

(b) without a radianal, viz.:

*Eutaxocrinus* Springer, genotype *E. affinis* (J. Müller, s. *Taxocrinus*).

*Parichthyocrinus* Springer, genotype *P. nobilis* (W. & Sp., s. *Ichthyocrinus*).

*Taxocrinus* Phillips, genotype?

The restriction of *Taxocrinus* has been brought into needless confusion by want of precision in previous writers. Phillips included the species *T. egertoni*, *T. tuberculatus*, *T. macrodactylus*, and *T. nobilis*, naming them in that order: he did not fix on any one as the type. De Koninck & Le Hon (1854, 'Recherches &c.,' Mém. Acad. Belg. vol. xxviii. p. 120) reserved the name "spécialement pour les espèces qui ne possèdent pas de pièces interradiales, et dont le calice semble exclusivement composé des pièces basales, ou de celles-ci et des premières pièces radiales, tels que les *T. macrodactylus*, Phill., et *T. (Cyathocrinus)*, *Rhenanus*, F. Roemer."

Thus they only mentioned one out of the original species, and this one—*T. macrodactylus*—has therefore some claim to be regarded as the genotype, even though the word type was not actually mentioned. The fact that *T. macrodactylus* does possess an interbrachial ("pièce interradiale") scarcely affects the question, for so do the other species, as already pointed out by Dr. Springer (Aug. 1902, Amer. Geol. p. 90). Unfortunately, in discussing the genus in their 'Revision' (1879, Proc. Acad. Nat. Sci. Philadelphia, p. 268), Wachs-muth & Springer said, "The first of these [i. e. *T. egertoni*] . . . must be considered, according to the most generally accepted rules of naturalists, the type of the genus." The so-called "first species rule" has now been given up, and in any case its application to *Taxocrinus* would not be so clear as the statement quoted might lead one to suppose. Apart from that, however, it might plausibly be maintained that this was the first definite selection of a genotype, and could not be overridden. It was accepted by S. A. Miller (1889, 'N. Amer. Geol. & Paleont.'), who writes "TAXOCRINUS, Phillips . . . Type *T. egertoni*." Curiously enough, it is Mr. Springer himself who appears (1906, p. 493) to suggest overriding it in the words "As *T. nobilis* and *T. macrodactylus* have hitherto been taken as the typical forms of the genus . . . it seems proper to retain the name for" species agreeing with them in brachial structure. This, it is true, is very indefinite, and one is only left to infer that Dr. Springer

no longer regards *T. egertoni* as the genotype. So far as I can judge from Phillips's original figure, that species would not form part of the genus as conceived by Dr. Springer, though what would happen to it I cannot say. The original of the figure was, with other specimens alluded to by Phillips, in the collection of Sir Phillip Egerton, the whole of which was purchased for the British Museum in 1882. But neither these specimens nor the specimens mentioned by Phillips as in the Enniskillen Collection, also purchased in the same year, have ever been found within the walls of this museum.

However this question may ultimately be solved, it will make no difference to the validity of the genus now to be proposed.

### CYDONOCRINUS\*, gen. nov.

*Diagnosis*.—A Taxocrinid with IBB projecting beyond the small stem-facet and entering the side-walls of the sub-globular patina; with no RA; with post. B projecting so that the rectal channel is entirely outside the radial facets; iBr probably minute, and, though the arms did not abut, the perisome uniting them was scarcely visible from the exterior.

The absence of a radianal places this in the section with *Eutaxocrinus*, *Taxocrinus*, and *Parichthyocrinus*. From all of these it differs in the relatively small stem-facet and in the large size and conspicuousness of the infrabasals. The globular shape of the cup, constricted round the peristome, is very different from the wide cups of *Eutaxocrinus*, *Taxocrinus*, and the broadly expanded *Parichthyocrinus*.

*Genotype*.—*C. parvulus*, sp. n.

*Holotype* in the Geological Department of the British Museum; registered E 15478. Collected by D. M. S. Watson, Esq., in 1907.

*Horizon*.—"Great Limestone," uppermost bed of the Yoredale Series, Upper *Dibunophyllum* zone of the Upper Viséan.

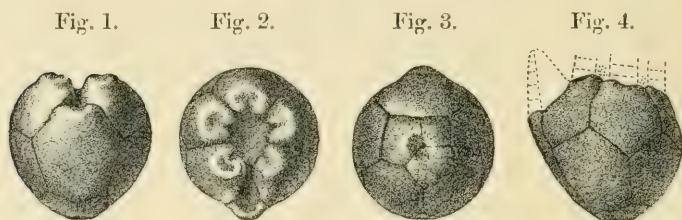
*Locality*.—Above Manchester Pct, Nidderdale, Yorkshire. Associated with numerous thecas of *Orbitremites derbiensis*, in which the spiracles other than the anal are more hooded over than is usual in the species, Brit. Mus., E. 16398–E 16419.

*Description of holotype*.—Measurements of the patina: height 6 mm.; sagittal greatest diameter 6.4 mm. at top of

\* *μῆλον κυδώνιον*, the quince; the name *Cydonocrinus* is formed on the analogy of *κυδωνόμελι*, quince-honey, mentioned by Dioscorides.

post. B; transverse greatest diameter 5·7 mm. on basiradial suture; transverse diameter at level of radial facets 4·3 mm.

Stem-facet (text-fig. 3) slightly concave, with no rim; elliptical or subpentagonal, being elongate from l. post. radius to r. ant. IR, and extended on the small IB, *i. e.* along r. post. radius; at the margin faint traces of crenellæ, approximately 15 in all; lumen minute, circular so far as can be observed. Long diameter of facet ca. 1·6 mm.



*Cydonocrinus parvulus*, the Holotype.

Fig. 1.—Posterior view.

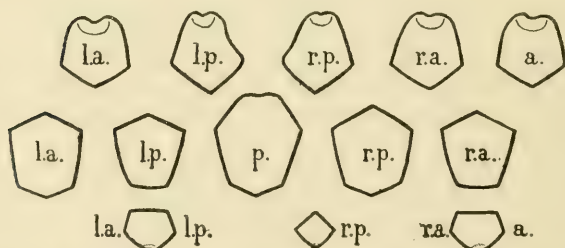
Fig. 2.—Views from above, with the posterior basal towards the observer.

Fig. 3.—View from below, with the posterior basal away from the observer.

Fig. 4.—View from the right side, with the probable anal structure and proximal parts of the arms dotted in.

All the drawings by A. H. Searle,  $\times 3$  diam.

Fig. 5.



*Cydonocrinus parvulus*. Analysis of the cup, the plates being drawn as accurately as their curvature permits.  $\times 3$  diam.

IBB. Greatest height ca. 1·5 mm.; height from basal plane ca. 1 mm.; plates slightly tumid and sutures distinct where not weathered.

BB. Height of r. ant. (pentagonal) 3·2 mm.; of l. ant. (hexagonal) 3·5 mm.; of post. (heptagonal) 4·5 mm. Width of normal BB, greatest above, ca. 3·3 mm.; of



post. B, 4 mm. Post. B rises above the level of the other BB, and continues the outward slope of the cup; its upper margin, seen from the side or the back, is approximately straight, but seen from above is boldly curved outwards.

RR. All wider below than above, bending inwards so as to give the cup its truncate globular shape. The facets do not occupy the full width of the radials, and the shoulders of the radials bend inwards between them, curving round the facets. This feature is more marked in the r. and l. post. RR, especially in the latter, where the radial rises up towards the facet more prominently than in the other rays. These two posterior radials thus bend inwards round the rectal channel, and approach within .5 mm. of one another at the shoulders; their facets, however, are .9 mm. apart.

	Width below. mm.	Width above. mm.	Width of facet. mm.	Height to top of facet. mm.
Ant. R . . . . .	3	ca. 2.2	ca. 1.8	3
l. post. R . . . .	3	2.1	1.6	3.3

The measurement "width above" is taken as near as may be at the widest part of the facet; thence the sides of the radials converge towards the oral pole. The inward bend of the radials cannot be properly represented in the analysis (text-fig. 5).

The outline of the facets is shown in text-fig. 2; they are wider than deep. Their joint-face lies, as a rule, at right angles to the long axis of the cup, but in the posterior radials, especially l. post. R, it slopes outwards a little, and this is why the facets are more clearly seen in text-fig. 1 than in text-fig. 4.

Each facet has a V-shaped ventral groove. There are traces of a transverse fulcral ridge in l. post. R, but in the others the surface is too much worn for details to be made out. The axial canal is not to be distinguished.

In text-fig. 4 an attempt is made to indicate the relations of the proximal region of the arms. It is fairly clear that there were no definite interbrachials, and that any finely plated perisome which may have connected the rays must have been well towards the inner face.

No anal plates are preserved, but their probable relations are indicated in text-fig. 4, on the analogy with *Taxocrinus*. A narrow vertical series of curved plates probably rested on the curved upper margin of post. B, and their edges were probably connected with the incurved edges of the posterior radials, and possibly with the lower part of the posterior

arms, by a finely plated perisome. None of these structures remain, so that, looking at the patina from above (text-fig. 2), one sees the opening of the rectal channel, of elongate pear-shape. It is obvious that the rectum must have passed upwards close to the curved posterior basal, and that it was therefore well outside the radial facets and the arms. Only the slight outward slope of the posterior radial facets remains to remind one of those more normal *Taxocrinids* in which the arms enclose the anal structures.

*Affinities of Cydonocrinus.*—That the species is closely allied to *Taxocrinus* (whatever the precise connotation of that name) must be admitted, and I have long thought that it might be more prudent to leave it in that genus, especially in the absence of evidence from the arms. But the small stem-facet, the relatively large infrabasals, the globular shape, and the projection of the periproct all give it so marked a character that no one seeing the specimen would feel tempted to call it merely *Taxocrinus*. Without waiting longer for further proof, I am induced to publish the species now under an independent generic name, in order to mark the tendency of its modifications towards the fossil from the supposed Permian of Timor hitherto known as *Hypocrinus piriformis*. That question is discussed in a paper now being offered for the 'Proceedings' of the Zoological Society.

XLVIII.—*Notes on the Lamellicorn Coleoptera of Japan and Descriptions of a few new Species.* By G. J. ARROW.

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WHILE engaged in incorporating into the British Museum collection the recently acquired Japanese Coleoptera collected by Mr. George Lewis, which have been the subject of so many important papers, I have found it necessary to make many rectifications in their nomenclature; while certain species remain without names. So many are the alterations and additions to the Pleurostict *Lamellicornia* (enumerated by Mr. Lewis in 1887 and 1895) that I have thought it desirable to compile a fresh list of that part of the Coleoptera.

Few corrections have to be noted relating to the Laparostict *Lamellicornia*, but the following points must be mentioned:—

*Trox niponensis*, Lew., is *T. scaber*, L., which has become distributed throughout the world.

*Onthophagus lutosipictus*, Fairm., from Ishigaki Shima, has to be added to the list.

*Aphodius major*, Wat., is *A. brachysomus*, Solsky, and not *A. sorex*, F., as formerly supposed.

*A. vitellinus*, Klug., must be added to the list. It was taken by Mr. Lewis at Hakodate, Sapporo, and Lake Junsai.

*A. orientalis*, Har., was found at Chiuzenji.

The specimen without precise locality, which Mr. Waterhouse described as *A. ovalis*, is identical with the specimen recognized by him a few pages earlier as the female of *A. nigerrimus*. The two forms were found together at Nagasaki.

*Aphodius 4-punctatus*, Panz., is a variety of the European *A. sordidus*, F.

The Lucanid genus *Nigidius* has been added to the list, M. Boileau having described a species, *N. lewisi*. Mr. J. E. A. Lewis has sent me this insect from Oshima Island.

The following are the Pleurostict Lamellicornia so far as at present known, 109 in number, as against 83 formerly catalogued by Mr. Lewis in his two lists of 1887 and 1895 :—

## MELOLONTHINÆ.

*Hoplia obducta*, Mots.

*variolosa*, Wat.

*H. gracilipes*, Lew.

*H. maculata*, Bates.

*H. communis*, Wat.

*H. reini*, Heyd.

*H. moerens*, Wat.

*Sericania mimica*, Lew.

*S. lewisi*, Arrow, sp. n.

*fuscolineata*, Lew., nec Motsch.

*Gastroserica herzi*, Heyd.

*G. brevicornis*, Lew.

*G. hignonii*, Lew.

*Paraserica grisea*, Mots.

*Ophthalmoserica boops*, Wat.

*Autoserica castanea*, Arrow, sp. n.

*A. secreta*, Brenske.

*Aserica orientalis*, Mots.

*Serica similis*, Lew.

*S. spissigrada*, Brenske.

*S. nigrovariata*, Lew.

*S. angulata*, Lew.

*S. 4-foliata*, Lew.

*Microserica brenskei*, Reitt.

*M. nipponensis*, Brenske.

*Maladera orientalis*, Mots.

*M. japonica*, Mots.

*M. salebroso*, Brenske.

*Apogonia amida*, Lewis.

*A. splendida*, Wat., nec Boh.

*A. major*, Wat.

*A. bicavata*, Arrow, sp. n.

*A. cupreoviridis*, Kolbe.

*A. bicarinata*, Lew.

*A. niponica*, Lew.

*Brahmina niponica*, Lew.

*Rhizotrogus niponicus*, Lew.

*Lachnosterna inelegans*, Lew.

*L. diomphalia*, Bates.

*L. picea*, Wat.

*L. morosa*, Wat.

*L. castanea*, Wat.

*L. nipponensis*, Lew.

*Pollaplonyx flavidus*, Mots.

*Heptophylla picea*, Mots.

*Polyphylla laticollis*, Lew.

*Granida albolineata*, Mots.

*Melolontha japonica*, Burm.

*Hoplosternus japonicus*, Har.

*H. haroldi*, Moser.

*M. frater*, Arrow, sp. n.

*Hoplosternus japonicus*, Wat.

## RUTELINÆ.

- Anomala rufocuprea*, Mots.  
*A. motschulskyi*, Har.  
*A. pleurimargo*, Reitt.  
*A. lucens*, Ball.  
*A. daimiana*, Har.  
*A. triangularis*, Schauf.  
*A. multistriata*, Har.  
*A. cuprea*, Hope.  
*A. japonica*, Arrow, sp. n.  
*A. albopilosa*, Hope.  
*A. albopilosa*, v. *gracilis*, Schauf.  
*A. chloroderma*, Arrow, sp. n.  
*A. xanthopleura*, Arrow, sp. n.  
*A. costata*, Hope.  
*A. testaceipes*, Mots.  
*A. holosericea*, F.  
*A. sieversi*, Heyd.  
*A. 8-costata*, Burm.  
*A. pubicollis*, Wat.  
*A. orientalis*, Wat.  
*A. irregularis*, Wat.  
*A. diversa*, Wat.  
     ♀ *maculicollis*, Reitt.  
*A. internixta*, Arrow, sp. n.  
     *irregularis*, var., Lewis.  
*A. conspurcata*, Har.  
*Mimela splendens*, Gyll.  
     *lathamii*, Hope.  
     *gaschkewitschi*, Mots.  
*M. flavilabris*, Wat.  
*M. difficilis*, Wat.  
*Popillia japonica*, Newm.  
*P. insularis*, Lew.  
*P. lewisi*, Arrow.  
*Adoretus tenuimaculatus*, Wat.

## DYNASTINÆ.

- Xylotrupes dichotomus*, L.  
*Eophileurus chinensis*, Fald.

## CETONIINÆ.

- Torynorrhina japonica*, Hope.  
*T. unicolor*, Mots.  
*T. polita*, Wat.  
*Protætia insperata*, Lew.  
*P. brevitarsis*, Lew.  
*P. cataphracta*, Arrow, sp. n.  
     *Cetonia submarmorea*, Wat.,  
     nec Burm.  
*P. lenzi*, Har.  
*P. orientalis*, G. & P.  
     *Cet. ærata*, Er.  
     *Cet. submarmorea*, Burm.  
*P. ishigakia*, Fairm.  
*P. lewisi*, Jans.  
*P. pryeri*, Jans.  
*P. oschimana*, Nonfr.  
*P. hondana*, Arrow, sp. n.  
*Cetonia pilifer*, Mots.  
*C. roelofsi*, Har.  
*Oxycetonia jucunda*, Fald.  
*O. forticula*, Jans.  
*Glycyphana fulvistemma*, Mots.  
*Anthracophora rusticola*, Burm.  
*Dasyvalgus angusticollis*, Wat.  
     *Valgus angusticollis*, Wat.  
*D. tuberculatus*, Lew.  
*Chromovalgus fumosus*, Lew.  
     *Valgus fumosus*, Lew.  
*C. lætus*, Arrow, sp. n.  
*Gnorimus subopacus*, Mots.  
*G. viridiopacus*, Lew.  
*Trichius japonicus*, Jans.  
*T. succinctus*, Pall.  
*T. 17-guttatus*, Voll.  
     *Gnorimus 17-guttatus*, Lew.  
*T. donitzi*, Har.  
*T. duplicatus*, Lew.  
*Osmoderma opica*, Lew.

## MELOLONTHINÆ.

Reitter in his 'Bestimmungs-Tabellen' has not been able to determine some of the Japanese species of *Hoplia*. I have therefore compiled for later publication a table of the members of this difficult group, of which others remain yet to be described. The differences between the sexes, which have been almost neglected, are important, and I consider it undesirable to add to the list of names, except in cases where the sexual characters have been made out.

Reitter has failed to identify the Chinese *Hoplia paiva*,



Woll. The male of this is his *Ectinohoplia variabilis* and *E. hispidula* is the female.

His *E. chrysur*, "var. *diabolica*," is the female of that species.

*H. maculata*, Bates, is certainly not a var. of *H. aureola*, Pall., the pronotum (amongst other differences) being much more transverse.

*Sericania lewisi*, sp. n.

Testacea, leviter metallica, capite, pronoto (lateribus et baseos medio exceptis), scutello suturaque elytrali fuscis, clypeo vel testaceo vel fusco, corpore supra omnino crebre punctato, elytris sulcatis, clypeo plano, rugose punctato, sutura frontali arcuate carinato.

Long. 8-9 mm.; lat. 4.5-5 mm.

*Hab.* JAPAN: Yokohama, Chiuzenji, Nikko.

Although very closely resembling the type species, *S. fuscolineata*, Motsch., from Manchuria, the Japanese species is distinct. A series of *S. fuscolineata* in the British Museum show no marked variation, and the Japanese specimens (except one unusually dark example) are all without the characteristic longitudinal lines upon the elytra. They differ also in the head, which is without the strong carina a little before the front margin of the clypeus referred to by Motschulsky, but has instead a carina upon the frontal suture. In the male the fifth joint of the antennæ has only a very short lamellar prolongation.

*Gastroserica herzi*, Heyd.

Mr. Lewis has mentioned as a pale variety of *S. higonia*, Lew., a specimen from Yuyama. It is actually a distinct species intermediate between *S. higonia* and *S. brevicornis*, and has been described by Heyden from Korea under the name of *Serica herzi*. I have seen an example taken by Leech at Gensan. In addition to its characteristic coloration (pale clypeus, black forehead, bimaculate pronotum, and dark suture and sides of the elytra), it is distinguished by the entirely obsolete front angles of the prothorax, nearly straight posterior lateral margins, and scutellum intermediate in length. The antennæ are almost as in *S. brevicornis*, having three long and one short lamella to the club of the male, but the clypeus, which is emarginate in *S. brevicornis*, has a straight margin in *S. herzi*. The three species just mentioned belong, with others, to the genus *Gastroserica* of Brenske.

*Autoserica castanea*, sp. n.

Oblongo-ovalis, castaneo-rufa, opalescens, clypeo lato, nitido, fortiter punctato, antice valde reflexo, subtilissime sinuato, medio leviter longitudinaliter carinato, fronte opaco, parce punctato et ciliato; pronoto sat punctato, lateribus antice leviter arcuatis, postice fere rectis; scutello fere rugose punctato; elytris profunde punctato-striatis, interstitiis irregulariter distincte punctatis.

Long. 9-9.5 mm.; lat. max. 5.5-6 mm.

*Hab.* JAPAN : Kobe (*J. E. A. Lewis*, 18. 6. 1912); N. CHINA : Tientsin, Shanghai, Foochow.

This is common in Japan, where it has been taken by Mr. G. Lewis, Lord Dormer, and others, but the localities have not been recorded.

It is exactly like *A. flammea*, Brenske (Hong Kong), but the clypeus is less rugose, the forehead more sparsely punctured, and the elytra have more convex interstices and less punctured striæ.

*Aserica orientalis*, Motsch.

Two or three species occur to which Motschulsky's vague description equally applies, and the identification is therefore uncertain in the absence of the type.

The names of three species of *Apogonia* have been recorded since the list of 1895, two of them described by Mr. Lewis himself, and this does not complete the Japanese species, of which one more is added here, while others must follow when more specimens are available.

In describing *Apogonia bicarinata* (Ann. & Mag. Nat. Hist. (6) vol. xvii. 1896, p. 333), Mr. Lewis characterized the front tibia as "not conspicuously dentate," but noting an exception in one "malformed" example from Oshima I. Although I do not know that specimen, it appears from three individuals from the Loochoo Is. (one of them taken by Mr. J. E. A. Lewis at Okinawa) that the type is the really malformed (or worn) example, and that the supposed malformation is a characteristic of the species. There are two well-marked terminal teeth and some fine serrations at the base. The carina on the upper face is elevated near the base, forming an obtuse angle there, and the outer edge of the tibia is drawn inwards towards this angle, presenting the appearance of a distortion.

The other species mentioned above is here named :—

*Apogonia bicavata*, sp. n.

Viridi-cuprea, parum nitida, postice sat lata; capite et pronoto dense punctato-rugosis, illo opaco, clypeo brevissimo grosse punctato, margine reflexo, vix sinuato, pronoti lateribus minus dense punctatis, marginibus post medium valde curvatis, antice rectis, reflexis, angulis anticis productis, excavatis; scutello parce punctato; elytris grosse sat crebre punctatis, costa saturali duabusque discoidalibus quarum interiori postice lata, fortiter punctata; pygidio crebre et grosso punctato; tibiis anticis fortiter bidentatis.

Long. 10 mm.; lat. max. 6 mm.

*Hub.* LOOCHOO Is.: Okinawa (*J. E. A. Lewis*, 23rd May, 1913).

This insect has a very close relationship to *A. major*, Wat., which has the front angles of the prothorax similarly hollowed out. It is a little smaller than *A. major* and less shining, with the sides of the prothorax straighter and more convergent in front and the front angles acuter and more deeply hollowed. The sculpture of the upper surface is strong and close, the clypeus very coarsely punctured, the forehead densely and confluent, the pronotum still more closely and deeply, but with the sides less closely punctured and rather shining. The lateral edges are strongly rounded behind the middle, and from there to the very acute front angles they are nearly straight, strongly convergent, and reflexed.

*Lachnosterna inelegans*, Lew.

This is treated by Messrs. Lewis and Waterhouse as the *L. parallela* of Motschulsky, whose name is preoccupied by Blanchard. Motschulsky's insect, however, was from Shanghai, and it is not *L. inelegans* but a species with protuberant pygidium very closely related to *L. diomphalia* which occurs in that region and which has hitherto been confused with it. The name *parallela* not being available, the hopeless problem of its identity is happily not of importance; but, from the point of view of geographical distribution, it is necessary to record that *L. inelegans* is known only from S. Japan and Formosa. *L. diomphalia*, described from Korea, is found also at Nagasaki and in N. China (Wei-hai-Wei), and exceedingly closely related species are found in other parts of China.

*Rhizotrogus niponicus*, Lewis, belongs rather to *Brahmina*, having the claws split and not toothed. They are rather short and the inner lobe is very broad.

The species occurs also in Korea (Kang-hwo), at Shanghai, and in Szechuen (Chin-fu-san).

*Lachnosterna niponensis*, Lewis, is found also in Korea (Fusan) and N. China (Chefu).

Two closely related species, enumerated by Waterhouse as *Hoplosternus japonicus*, Har. and *Melolontha japonica*, Burm. respectively, were brought in numbers by Lewis. Capt. Moser has followed Waterhouse in assigning these names to the two species, but, recognizing the species as congeneric, has changed Harold's *japonicus* to *haroldi*, overlooking the fact that Harold himself announced his insect to be the same as Burmeister's. No one has yet pointed out the distinguishing features between the two species, which are so close that it is not always an easy matter to distinguish the females. The true *H. japonicus*, Burm., however, is distinguished by the nearly black head, thorax, legs, and underside, the yellow colour of the dorsal pubescence, which is erect and velvety upon the pronotum, the opacity of the latter, and, in the male, the strongly rounded and reflexed margin of the clypeus and much produced pygidium.

The original descriptions leave little doubt of Harold's correctness in sinking his name as synonymous, and the second species is therefore still nameless. It may be called

*Melolontha frater*, sp. n.

Obscure castanea, omnino griseo-setosa, abdominis lateribus albo-maculatis: corpus cylindricum, elongatum, supra densissime punctulatum; pronoto subnitido, lateribus valde arcuatis, angulis posticis acutis; elytri utrius disco 3-costato; pygidio recte et obtuse acuminato; processu sternali brevi, acuto:

♂, clypeo transverso, excavato, margine antica integra, leviter arcuata, clava antennali heptaphylla, longitudine 4.5-5 mm., tibia antica acute bidentata; pygidio subtus plano, nitido:

♀, clypeo brevi, marginis medio leviter indentato, clava antennali brevi, hexaphylla, tibia antica 3-dentata.

Long. 24-30 mm.; lat. 12-15 mm.

*Hab.* S. JAPAN: Nara, Kioto, Kii Wada, Kobe (June, July).

It is rather more solid and robust than *M. japonica*, more uniformly reddish in colour, and with the pubescence less yellow. The pronotum is rather more shining and its hairy clothing has not the velvety nature due to its erect arrangement in *M. japonica*. The hind angles are rather less acute,



and the slight sinuation noticed by Harold in describing *M. japonica* is absent. The male has the clypeus less rounded than in that species, and the female has the last abdominal segment straight and not emarginate posteriorly.

It is very like *M. incana*, Mots., from N. China and Korea, but is rather larger, less shining, with the pygidium more pointed, the clypeus not truncate, and the mesosternal process shorter.

The species with a distinctly produced sternal process are at present separated as *Hoplosternus*, but I am not able to recognize that genus. The sternal process is very inconstant, and, if accepted as a generic character, would lead to the two sexes of *Melolontha guttigera*, Sharp, being placed one in *Melolontha* and the other in *Hoplosternus*.

#### RUTELINÆ.

I am unable to find any characters sufficient for the retention of *Anomala*, *Euchlora*, and *Phyllopertha* as separate genera, and, omitting *A. flavilabris*, Wat., and *difficilis*, Wat., which are better placed in the genus *Mimela*, I regard the seventeen Japanese species enumerated by Mr. Lewis under these various names as belonging to *Anomala*, and that number must be considerably increased.

The Japanese insect called *A. mongolica*, Fald., although closely related to it, is distinguishable, being equally closely related to *A. cuprea*, Hope. It may be called

#### *Anomala japonica*, sp. n.

Supra saturate viridis, submetallica, subtus cum pedibus rufo-cuprea, corpore supra omnino densissime punctato, clypeo transverso subarcuato, pronoti basi haud marginato; elytra linea punctata juxta-suturali aliisque vix perspicuis impressis, postice modice late membranaceis; pygidio crebre et minute granoso-rugoso, basi parce piloso, pectoris abdominisque lateribus albido-hirsutis, pedum 4 anteriorum ungue majori fisso:

♂, tibiæ anticæ dente supero obsoleto:

♀, tibia antica bidentata, dente apicali sat longo.

Long. 19–25 mm.; lat. max. 10–14 mm.

*Hab.* S. JAPAN: Niigata; KOREA: Kang-hwo (*Miss Scarlett*).

This is larger on the average than *A. mongolica*, less shining, and more finely, densely, and uniformly punctured above, and the pygidium is less hairy. It is very closely allied to *A. cuprea*, but differs, besides its green and scarcely metallic upper surface, in being more strongly and densely

punctured above. A slightly shining coppery-green variety (var. *borealis*, m.) occurs in Hakodate, which is still nearer to *A. cuprea*, so that the interval between *A. mongolica* and *A. cuprea* is completely bridged and their separation as *Anomala* and *Euchlora* respectively becomes impossible. The difference in the front claws of the male referred to by Mr. Lewis does not exist here.

Belonging to the same group and closely related to the last are *A. albopilosa*, Hope, and *gracilis*, Schauf. The latter is considered by its author to be a variety of *A. albopilosa*, but by Mr. Lewis to be a distinct species. In my opinion the difference between species and varieties becomes in these insects one of individual taste. Hitherto undistinguished from *A. albopilosa*, but really belonging to another group, in spite of the close external resemblance, are the two species which follow:—

*Anomala xanthopleura*, sp. n.

Supra viridis, pronoti et elytrorum marginibus flavis, pygidio metallico, antice viridi, postice flavescenti, corpore subtus roseo-flavo, tibiis tarsisque cupreis, corpore supra subnitido, dense punctato, clypeo truncato, rugoso; elytris lineis longitudinalibus punctatis subsuturalibus et medianis (harum circum 5) distincte impressis, marginibus externis reflexis, postice dilatatis et subangulatim abbreviatis, subtus castaneis, sat late membranaceis; pygidio dense rugoso, fere opaco, vix piloso; corporis subtus lateribus punctatis, modice griseo-pilosis; tibia antica bidentata, pedum anticorum et intermediorum ungue majori fisso:

♂, tibiæ anticæ apice subacuto, ungue majori antico fere ad apicem minute angulatim dilatato:

♀, tibiæ anticæ apice longe lobato.

Long. 19–22 mm.; lat. max. 11–12 mm.

*Hab.* Loo Choo Is.: Okinawa I. (*J. E. A. Lewis*, May 1913).

This has the colour, size, and general appearance of *A. albopilosa*, Hope, but in the peculiar dilated elytra and ædeagus of the male it is quite different, and is evidently closely related to *A. expansa* and *truncata*, Bates. It is smaller than either, strongly and densely punctured above, and rather more shining than *A. truncata*, but less so than *A. expansa* and markedly distinct also by the pale-coloured lower surface and femora. The ædeagus of the male has the paramera produced upon the centre line into a pair of short overlapping lobes.

*Anomala chloroderma*, sp. n.

Supra viridis, pronoti et pygidii lateribus flavis; corpore subtus roseo-flavo, tibiis tarsisque cupreis; corpore supra dense punctato, clypeo brevi, subquadrato, rugoso; elytris lineis longitudinalibus punctatis subsuturalibus et medianis (harum circum 5) sat distincte impressis, extus haud late marginatis, marginibus viridibus, paulo reflexis, postice haud abrupte abbreviatis; pygidio viridi-metallico, rugoso, longe griseo-piloso; corporis subtus lateribus punctatis, modice griseo-pilosis; tibia antica bidentata, pedum anticorum et intermediorum ungue majori fisso:

♂, tibiæ anticæ apice subacuto, ungue majori antico fere ad apicem minute dilatato:

♀, tibiæ anticæ apice obtuse lobato.

Long. 23–26 mm.; lat. max. 13–14 mm.

*Hab.* OSHIMA I.: Naje (*Ferrié*, 1895).

It is closely related to *A. xanthopleura*, but a little larger and more finely punctured above, with distinct but narrower lateral margins to the elytra. The margins are not differently coloured to the rest of the elytra and do not end abruptly behind. The ædeagus of the male has its paramera produced into long finger-like processes on the median line and rather sharply angulated externally.

These two species are most clearly allied to *A. expansa* and *truncata*, Bates, with which they form a group peculiar to this region and remarkable for the strange development of the outer margins of the elytra.

Several species were united by Messrs. Waterhouse and Lewis under the name of *A. rufocuprea*, Mots. They have been distinguished by Reitter in his 'Bestimmungs-Tabellen.' It will be useful to give the localities:—

*A. rufocuprea*, Mots. ... Hakodate, Yokohama (*Swinhoe*),  
Ta-lien-hwan.

*A. motschulskyi*, Har. ... Mt. Simbara (*P. A. Holst*).

*A. lucens*, Ball. .... Hakodate, Yezo, Nikko, Nio-  
hosan.

*A. pleurimargo*, Reitt. ... Nagasaki, Yama-guchi (*Hiller*).

*Anomala (Phyllopertha) intermixta*, sp. n.

Obscure cuprea, capite, pronoto scutelloque aureo-vel igneo-viridibus, elytris nigris vel fuscis; corpus modice elongatum, depressum, sat sparse griseo-pilosum, capite grosse granuloso, vertice fortiter punctato, clypeo lato, antice recto vel lævissime emarginato; pronoto brevi nitido, fortiter haud dense punctato, angulis posticis paulo acuminatis; elytris ruguloso-punctatis, crebre

striatis, lateribus antice paulo explanatis; pygidio rugoso, longe setoso:

♂, pedis antici ungue majori lato, dentibus 2 tibialibus brevibus, acutis:

♀, clypeo antice, pronoti marginibus lateralibus suturaque plerumque rufis, elytrorum lateribus magis explanatis, tibiæ anticæ dentibus 2 obtusis:

*Var.* elytris testaceis.

Long. 9–11.5 mm.; lat. 4.5–6 mm.

*Hab.* Nikko, Sapporo, Chiuzenji.

This species was referred to the familiar *Phyllopertha horticola*, L., by Waterhouse, but treated by Lewis as a variety of *P. irregularis*, Wat. It is readily distinguishable from the latter by the coarser sculpture, non-metallic elytra, straight clypeus, &c., but is very closely related to *P. horticola*. It differs, however, in its broader form and less hairy body, and especially by the shorter, more transverse, and more strongly and distinctly punctured pronotum, which is usually of a golden or fiery-green colour. The clypeal margin is straight in front or feebly concave. The last joint of the maxillary palpus is very large and hatchet-shaped.

I have recently described a new species of *Popillia* (*P. lewisi*), from Okinawa I., in a paper dealing with the genus *Popillia* (Ann. & Mag. Nat. Hist. (8) vol. xii. 1913, p. 45).

#### CETONINÆ.

##### *Protætia hondana*, sp. n.

Rufo-cuprea, prothorace, elytris pygidioque sat late viridibus, opacis, tenuiter albo-signatis: corpus elongatum, clypeo bilobato, lobis rotundatis, capite crebre punctato; pronoto quam longitudinem parum latiore, subplano, fere æqualiter bene punctato, linea mediana lævi, lateribus fere rectis, basi leviter trisinuato, linea alba laterali punctisque pluribus discoidalibus; scutello sat angusto; elytris extus modice punctatis, lateraliter fortiter sinuatis, apice haud angulatis, cum pygidio tenuiter albo-signatis, hoc subtiliter transverse strigato; corporis subtus lateribus fortiter strigoso-punctatis, haud dense flavo-pilosis, medio toto polito.

Long. 23 mm.; lat. max. 12 mm.

*Hab.* Kobe (July, 1913), Tanegashima (May, 1913), Hiroshima (Janson Coll.).

This is the only known Japanese *Protætia* in which the upper surface is covered with opaque bloom, as in the much



smaller *Cetonia pilifer* and *velofsi*. It is a narrow-bodied insect, with the upper surface rather bright green and the head, legs, and lower surface fiery-copper coloured, and marked with fine white dots and lines upon the pronotum, elytra, and pygidium almost exactly as in *P. lenzi*. The clypeus is divided into two rounded lobes, with only slightly reflexed margins; the sides of the prothorax are very gently and regularly curved and the base narrowly and not deeply excised before the scutellum and very feebly on each side. The sides of the elytra are strongly excised behind the shoulders and the apical angles are not sharp. The sternal process is small and very little produced.

Two specimens have been taken by Mr. J. E. A. Lewis.

The type in the British Museum is a male from Kobe; the specimen from Tanegashima is a monstrosity, with a split pronotum.

The beetle attributed by Messrs. Waterhouse and Lewis to *Protætia submarmorea*, Burm., is certainly not that species, and Reitter is probably correct in believing the latter to be synonymous with *P. avata*, Er. That species (as mentioned by Burmeister) has the form of *P. marmorata*, F., the scutellum very short and blunt, and the elytra punctured in the scutellar region, none of which features apply to the present species. For it I propose the name

*Protætia cataphracta*, sp. n.

Toto rufo-cuprea, elongata, angusta, nitida, clypeo fere recte truncato, margine reflexo, medio vix indentato, capite sat fortiter punctato; pronoto angusto, medio late fere lævi, lateribus intus fortiter punctatis, extus crebre strigosis, marginibus externis medio subangulatis, angulis posticis haud rotundatis, basi medio profunde exciso; scutello lævi, apice haud valde obtuso; elytris longis, extus sat crebre haud profunde strigosis, postice tenuiter transverse albido-maculatis, apicibus haud spinosis; pygidio dense transversim strigoso; pectore aureo-hirto, metasterni lateribus coxisque posticis fortiter strigosis, hic extus acute spinosis:

♂, abdomine profunde longitudinaliter sulcato:

♀, pygidio utrinque oblique impresso.

Long. 22-24 mm.; lat. max. 12-13 mm.

*Hab.* N. JAPAN: Nikko, L. Junsai, Fusai, Usui Pass.

Amongst a dozen specimens there is only a single male.

The elongate form, coppery-red colour, and shining upper surface, strongly and coarsely striolated at the sides of the

pronotum and elytra, are sufficient to distinguish this species. It closely resembles *P. insperata*, Lewis, which is more brassy in colour and has only feebly punctured, not striolated, elytra. The abdomen in the male of the latter is not deeply channelled beneath, and sometimes only curved. Reitter, in his 'Bestimmungs-Tabellen,' has probably taken the new species for *P. insperata*, or combined the two. On account of the ventral groove, *P. cataphracta* belongs to the genus *Pachnotosia* of Reitter (*Liocola*, Thoms.); but, even if it is considered desirable to admit genera depending on a feature peculiar to one sex (which I must dispute), the distinction fails in *P. insperata*, different individuals of which might be referred to different genera. Putting aside the species most closely related to *Cetonia aurata*, which have a vertical mesosternal process, no adequate basis for the further subdivision of the ancient genus *Cetonia* seems to me to have been discovered, and I prefer to use the name *Protætia* for the remaining species.

Five or six species very closely allied to *P. cataphracta* occur in Japan, and equally closely related forms occur in China and Formosa. The nomenclature of these has become greatly confused, and I think the following table of the species of the group will be serviceable. Two allied species from Formosa have been named respectively by Capt. Moser *Liocola formosana* and *Calopototia formosana*. As these can, at the most, only be subgenerically separated, I have changed the specific name of the second to *inquinata*. It is distinguished (perhaps in the male alone) by a peculiar S-shaped spur at the end of the hind tibia.

### *Key to Protætia orientalis Group.*

Clypeus not distinctly bilobed.

Elytra feebly sculptured, pygidium very finely.

Elytral marks diffuse ..... *marmorata*, F.

Elytral marks well defined.

Large, bronzy; sides of pronotum subrugose ..... *insperata*, Lew.

Small, green; sides of pronotum simply punctured, ..... *davidiana*, Fairm.

Elytra strongly sculptured.

Pronotum not deeply excised before scutellum.

Green; pygidium coarsely strigose .... *speculifera*, Swartz.

Bronzy; pygidium very finely strigose . *formosana*, Moser.

Pronotum deeply excised before scutellum.

Not very elongate; pronotum broad at base, with rounded sides.

Sides of elytra densely striolated .... *brevitarsis*, Lew.

Sides of elytra not densely striolated.	
Pygidium not very finely striolated.	<i>fairmairei</i> , Kr.
Pygidium very finely striolated. . . . .	<i>thibetana</i> , Kr.
Elongate; pronotum narrow, with the sides angulated . . . . .	<i>cataphracta</i> , Arr.
Clypeus distinctly bilobed.	
Clypeal lobes rounded.	
Very smooth and shining; pronotum little punctured. . . . .	<i>inquinata</i> , nom. nov.
Not smooth and shining; pronotum strongly punctured.	
Pronotum narrow, feebly excised, middle line elevated . . . . .	<i>lenzi</i> , Har.
Pronotum not narrow, deeply excised.	
Pronotum strongly and evenly punctured . . . . .	<i>ishigakia</i> , Fairm.
Pronotum strigose at sides. . . . .	<i>crassa</i> , Har. ( <i>? orientalis</i> , [Kolbe]).
Clypeal lobes dentate.	
Knees of four posterior legs with hairy pads.	
Pygidium flat; pronotum lightly punctured . . . . .	<i>marginicollis</i> , Ball.
Pygidium elevated; pronotum strongly punctured. . . . .	[G. & P.).
Knees of posterior legs not padded . . . . .	<i>ærata</i> , Er. ( <i>? orientalis</i> , <i>famelica</i> , Jans.

*Glycyphana jucunda*, Fald., and *forticula*, Jans.—These two closely allied species belong to the genus *Oxyctonia*.

Three Japanese species have been placed in the genus *Valgus*, which has since been restricted by Prof. Kolbe to two or three inhabitants of the temperate zone in which the female has a long caudal spine. Of the three, *V. angusticollis*, Wat., and *tuberculatus*, Lewis, belong to the genus *Dasyvalgus*, the former resembling *D. penicillatus*, Bl., while the latter is related to *D. ovicollis*, Arr.

*V. fumosus*, Lewis, also belongs to the group *Dasyvalginae*, but is generically different from the other two species. It agrees in the main with *Spilovalgus*, Kolbe, but differs by the sharply spinose propygidial spiracle, the slender tarsi, and thoracic carinae converging instead of diverging behind. These features are still more strongly marked in a new species to be described. The slender tarsi and the form of the front tibia of the latter would justify its location in the genus *Chromovalgus*, Kolbe, but as the two species in the sharp spiracles of the propygidium agree better with each other than with the single species of the other two genera, it would be quite unnatural to separate them. *Chromovalgus* and *Spilovalgus* differ only by very slight characters, and rather than make yet another genus, which would be an unsatisfactory one as combining features of the two, I

propose, at least provisionally, to treat these four species as belonging to a single genus, which must be called *Chromovalgus*.

The species are *C. peyroni*, Muls., *modiglianii*, Kolbe, *fumosus*, Lewis, and the new

*Chromovalgus letus*, sp. n.

Niger, squamis discoidalibus nigris et flavis sat dense vestitus, squamis flavis pronoti in angulis posticis minus crebre aggregatis, elytrorum crebre ordinatis, vitta nigra sublaterali ab humero fere ad apicem attingenti intus bis dilatata; abdomine toto pectorisque lateribus crebre flavo-squamosis, metasterni medio parce setoso; capite nitido, grosse punctato, parce setoso, clypeo emarginato; pronoto angusto, lateribus arcuatis, antice crenatis, postice paulo contractis, angulis posticis obtusis, disco antice acute bicarinato, carinis postice leviter approximatis, usque medium haud productis; scutello angusto, dense flavo-squamoso; propygidio et pygidio dense flavo-squamosis, illius spiraculis acute spinosis; tibia antica lato, dentibus 1°, 3°, 5° acutis, 2° sat acuto, 4° parum elevato, obtuso, tarsis (♂) longis et gracilibus.

Long. 6.5 mm.; lat. 3.5 mm.

*Hab.* Loo Choo Is.: Oshima (*J. E. A. Lewis*, May, 1913).

This is a gaily decorated little insect, of which the greater part of the surface is covered with round, closely-set scales, varying in colour from pale yellow to bright orange, but the head is free from scales, those of the pronotum are mixed black and yellow (the latter becoming closer in the hind angles), and each elytron has two black patches, united externally by a longitudinal black band which extends from the shoulder almost to the hind margin.

In its general form it is like *C. fumosus*, Léwis, but it is smaller and more brightly coloured. The tarsi are longer, the second and fourth teeth of the front tibia are distinct and not merely low ridges, and the spiracles of the propygidium are still longer.

The Japanese Valgini are all large forms, and it is a remarkable feature of the Valgini that, contrary to the general rule, the tropical species are usually small, while those occurring further north, although less numerous, are of the largest size.



## THE ANNALS

AND

## MAGAZINE OF NATURAL HISTORY.

[EIGHTH SERIES.]

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XLIX.—*On a small Collection of Marine Shells from Henderson Island.* By E. A. SMITH, I.S.O.

[Plate IX.]

HENDERSON ISLAND, also known as Elizabeth Island, is situated in the South Pacific Ocean, being an outlier of the Paumotu group, and not very remote from Pitcairn Island. Captain F. W. Beechey, R.N., who investigated the island in 1825, has given some account of it in his "Narrative of a Voyage to the Pacific and Beering's Strait in H.M.S. 'Blossom,'" 1831, vol. i. pp. 61-65. In the British Museum are various specimens obtained on that voyage at the Paumotu, and presented by Captain Beechey, and, although no particular island is specified, it is quite possible that some of them were collected at Henderson Island. It was apparently visited by Hugh Cuming during the early part of last century, since a few species obtained by him when collecting in the archipelago have been assigned to this island. Other collectors have since visited the Paumotu, but I have not observed that any of them have recorded species from Henderson Island. M. Couturier\* has given an extensive list of the shells of this region, and it includes a large proportion of those quoted in the following catalogue, excepting the bivalves, which he has not dealt with.

The present collection was made by Mr. J. R. Jamieson, assisted by Mr. D. R. Tait, and these gentlemen have

\* Journ. de Conch. 1907, pp. 123-178.

kindly presented a selection of the specimens to the British Museum.

A glance at the list at once tells us that the majority of the species are common well-known forms, having a wide range in the Pacific, some as far north as the Sandwich Islands, and many of them also occurring in the Indian Ocean, and in a few instances even in the Red Sea.

The collection apparently indicates that a rich Molluscan fauna exists at this island. At present only the more conspicuous species have been collected, and doubtless many smaller and less noticeable forms could be found by closer and more extended research, more especially if dredging were resorted to.

### LIST OF THE SPECIES.

- |  |  |
|--|--|
| <i>Acmæa conoidalis</i> , Pease.         | <i>Bursa</i> (Colubrellina) <i>affinis</i> (Broderip). |
| <i>Patella stellæformis</i> , Reeve.     | — (Craspedotriton) <i>convoluta</i> (Broderip).        |
| <i>Haliotis pulcherrima</i> , Martyn.    | <i>Colubraria nitidula</i> (Sowerby).                  |
| <i>Broderipia iridescens</i> (Broderip). | <i>Cassis</i> (Casmaria) <i>vibex</i> (Linn.).         |
| <i>Stomatella speciosa</i> , A. Ad.      | <i>Morum ponderosum</i> (Hanley).                      |
| <i>Calliostoma roseopictum</i> , sp. n.  | <i>Vanicoro plicata</i> (Récluz).                      |
| <i>Turbo petholatus</i> , Linn.          | <i>Strombus floridus</i> , Lamarck.                    |
| — <i>argyrostoma</i> , Linn.             | <i>Latirus nodatus</i> (Martyn).                       |
| <i>Nerita plicata</i> , Linn.            | <i>Mitra pontificalis</i> , Lamarck.                   |
| — <i>melanotragus</i> , Smith.           | — <i>fulva</i> , Swainson.                             |
| <i>Helicina solidula</i> , Gray.         | — <i>auriculoides</i> , Reeve.                         |
| <i>Littorina obesa</i> , Sowerby.        | — <i>maculosa</i> , Reeve.                             |
| — <i>trochoides</i> , Gray.              | <i>Caducifer cylindrica</i> (Pease).                   |
| <i>Amalthea australis</i> (Lamk.).       | <i>Nassa papillosa</i> (Linn.).                        |
| <i>Cypræa arenosa</i> , Gray.            | — <i>gaudiosa</i> , Hinds.                             |
| — <i>scurra</i> , Chemnitz.              | <i>Maculotriton bracteatus</i> (Hinds),                |
| — <i>isabella</i> , Linn.                | var.   |
| — <i>subteres</i> , Weinkauff.           | <i>Tritonidea difficilis</i> , sp. n.                  |
| — <i>caput-serpentis</i> , Linn.         | — <i>rosacea</i> , sp. n.                              |
| — <i>poraria</i> , Linn.                 | <i>Pisania decollata</i> , Sowerby.                    |
| — <i>helvola</i> , Linn.                 | <i>Engina fuscolineata</i> , sp. n.                    |
| — <i>cumingii</i> , Gray.                | <i>Columbella turturina</i> , Lamarck.                 |
| — <i>irrorata</i> , Solander.            | — <i>varians</i> , Sowerby.                            |
| — <i>goodallii</i> , Gray.               | — <i>obtusa</i> , Sowerby.                             |
| — <i>minoridens</i> , Melvill.           | <i>Thais intermedia</i> (Kiener).                      |
| — <i>childreni</i> , Gray.               | <i>Iopas sertum</i> (Bruguère).                        |
| — <i>cicercula</i> , Linn.               | <i>Vexilla vexillum</i> (Chemnitz).                    |
| — <i>margarita</i> , Solander.           | — <i>tæniata</i> (Powis).                              |
| <i>Trivia oryza</i> (Lamarck).           | <i>Drupa horrida</i> (Lamarck).                        |
| <i>Mamilla simiæ</i> (Récluz).           | — <i>clathrata</i> (Lamarck).                          |
| <i>Natica dillwynii</i> , Payraudeau.    | — <i>ricinus</i> (Linn.).                              |
| <i>Ianthina communis</i> , Lamarck.      | — <i>morus</i> (Lamarck).                              |
| <i>Vertagus obeliseus</i> (Bruguère).    | — <i>tuberculata</i> (Blainville), var.                |
| <i>Cerithium tuberculiferum</i> , Pease. | — <i>dealbata</i> (Reeve).                             |
| — <i>nassoide</i> , Sowerby.             | <i>Quoyula madreporarum</i> (Sowerby).                 |
| — <i>rarimaculatum</i> , Sowerby.        | <i>Conus lividus</i> , Hwass.                          |
| <i>Royella sinon</i> (Bayle).            |  |
| <i>Epitonium perplexum</i> , Pease.      |  |

<i>Conus hebraeus</i> , Linn., and var.	<i>Arca maculata</i> , Sowerby.
<i>vermiculatus</i> , Lamk.	— (Acar) <i>domingensis</i> , Lamarck.
<i>miliaris</i> , Hwass.	— (Barbatia) <i>parva</i> , Sowerby.
<i>ceylonensis</i> , Hwass, var.	<i>Pecten pallium</i> , Linn.
<i>nanus</i> , Brod.	— <i>coruscans</i> , Hinds.
<i>tessellatus</i> , Born.	<i>Lima bullifera</i> , Deshayes.
<i>rattus</i> , Hwass.	<i>Spondylus</i> sp.
<i>pennaceus</i> , Born, var. <i>episcop-</i>	<i>Lucina</i> ( <i>Codakia</i> ) <i>divergens</i> , Phi-
<i>pus</i> , Lamk.	<i>lippi</i> .
<i>solidus</i> , Sowerby.	<i>Libitina guineaica</i> ( <i>Chemnitz</i> ).
<i>glans</i> , Hwass, var. <i>tenui-</i>	<i>Tellina scobinata</i> , Linn.
<i>striatus</i> , Sowerby. A slender	<i>Semele australis</i> ( <i>Sowerby</i> ).
form of this variety.	<i>Corculum productum</i> ( <i>Deshayes</i> ).
<i>tulipa</i> , Linn.	<i>Tridacna crocea</i> , Lamarck.
<i>Bulla</i> sp. juv.	— <i>squamosa</i> , Lamarck.
<i>Melampus luteus</i> ( <i>Quoy &amp; Gai-</i>	<i>Chama jukesii</i> , Reeve.
<i>nard</i> ).	

## NOTES ON A FEW OF THE SPECIES.

*Morum ponderosum* (Hanley).

*Oniscia ponderosa*, Hanley, Proc. Zool. Soc. 1858, p. 255, pl. xlii. figs. 9, 10.

*Oniscia exquisita*, Tryon (non Adams and Reeve), Man. Conch. vol. vii. p. 282, pl. x. fig. 22 (copy of Hanley's fig. 10).

It is interesting to know the locality of this rare species, the habitat being hitherto unrecorded. It is quite distinct from the *Oniscia exquisita* of Adams and Reeve\*, with which it has been incorrectly united by Tryon.

*Morum exquisitum* was dredged in 16–20 fathoms in the Sooloo Archipelago, which is very remote from Henderson Island.

*M. ponderosum* differs from *M. exquisitum* in its less elevated spire, the absence of granules on the columellar callus (which is not of a rosy-purple colour), in the thickened labrum being peppered with red dots on the outside, and the liræ within, which do not extend across the front of it. The columellar side of the aperture is transversely lirate within throughout the whole length, a feature which does not appear to be present in the Sooloo species. The apex of the spire in the latter is red, whereas in *ponderosum* it is white, and the concavity of the upper part of the whorls is finely spirally striated, which does not appear to be the case in *M. exquisitum*.

\* Voy. 'Samarang,' Zoology, Mollusca, p. 35, pl. v. figs. 3 a-b; Reeve, Conch. Icon. vol. v. fig. 3.

*Lima bullifera*, Deshayes.

*Lima bullifera*, Deshayes, in Maillard's Ile de la Réunion, vol. ii. p. 30, pl. xxxi. figs. 9, 10 (1863).

This species is remarkable on account of the scales on the costæ taking the form of little hollow globules and having the appearance of perfectly rounded solid tubercles. In the Henderson Island worn shells these are only preserved in one or two specimens. Deshayes was under the impression that the species never attained to a large size, and he gives the length as only 20 mm. The largest example from Henderson Island, however, is 48 mm. long. The number of costæ is said to be twenty, but in the specimens under examination there are about twenty-four to twenty-seven.

A remarkable feature in these shells, not noticed by Deshayes, is that the elongate muscular impression within the valves is of a yellowish colour. This, however, is more evident in some specimens than in others, and consequently in the smaller and possibly young shells described by Deshayes this colouring might not have been present or even overlooked.

At first sight this species, as remarked by its founder, might be taken for the well-known *L. squamosa*, Lamk., the *Ostrea lima* of Linnæus.

The occurrence of *L. bullifera* at such distant localities as Réunion Island and Henderson Island is not surprising, since the distribution of *L. squamosa* is equally remarkable, being practically world-wide (see Lischke, Japan. Meeres-Conch. Theil i. p. 162; Smith, 'Challenger' Lamelli-branchiata, p. 287).

*Broderipia iridescens* (Broderip).

*Scutella iridescens*, Broderip, Proc. Zool. Soc. 1834, p. 48.

*Broderipia iridescens*, Pilsbry, Man. Conch. vol. xii. p. 46, pl. i. figs. 5-8, pl. ii. figs. 41, 42.

*Hab.* Grimwood's Island, Pacific Ocean (*Broderip*); Marutea (= Lord Hood Island) and Vahitahi Island, Paumotu group (*Couturier*, J. de Conch. 1907, p. 172); Ile Réunion (*Deshayes*).

I have been unable to discover any record of a Grimwood Island, but it is probably in the South Pacific as recorded by Pilsbry. He does not, however, refer it to any particular group of islands.

The dimensions of the single specimen from Henderson



Island far exceed those given by Broderip and other authors. It is 10 mm. long, 6 in diameter, and 2.5 in height.

*Natica dillwynii*, Payraudeau.

*Hab.* Mediterranean, St. Helena, West Indies, Mauritius, and South Pacific (see Smith, Proc. Zool. Soc. 1890, p. 270).

In the Henderson Island specimens the reddish-brown articulations on the two white zones on the body-whorl are not so distinctly arrow-head-shaped, and the markings on the white base around the umbilicus consist of a series of small dots instead of the conspicuous curved brown lines which occur in Mediterranean and West-Indian specimens. I have not seen the operculum of Mauritian or South-Pacific examples.

DESCRIPTIONS OF NEW SPECIES.

*Engina fuscolineata*. (Pl. IX. fig. 1.)

Testa parva, ovato-fusiformis, alba, inter costas nodulosas fusco lineata; anfractus normales sex planiusculi, paulo infra suturam sulco constricti, oblique costulati, transversim striati, costulis nodulosis, in anfractu ultimo flexuosis, basim versus minus nodulosis; apertura angusta, intus flavescens; labrum incrassatum, album, denticulis circiter sex intus armatum, ad marginem fusco notatum; columella denticulis externis ad quinque et plicis vel denticulis internis duobus medianis instructa, callo tenui nitente definito induta; canalis anterior obliquus, leviter recurvus.

Longit. 9, diam. 4 mm.

This species is well characterized by the style of the markings, the fine dark brown lines between the nodulous costæ being very striking. The oblique costæ on the upper whorls have three or four tubercles on each, these being caused by transverse fine sulci or impressed lines cutting across the ribs. The body-whorl is somewhat contracted below the middle and has about ten nodules on the ribs. The anterior end is crossed by three or four conspicuous grooves, and the ridges between them are scarcely affected by the longitudinal costæ, and consequently appear almost non-nodulous. On the labrum the most posterior tubercle is somewhat distant from the next, so that a slight sinus is formed. The uppermost or hindmost denticle on the columella is a little within and near the hindmost one on the labrum. The four other denticles upon the outer edge correspond to the terminations of the oblique ridges upon the lower portion of the whorl. The two internal denticles are

almost like folds, such as occur in the genus *Mitra*, and the lower one is formed by the edge of the columella bordering the canal.

*Tritonidea difficilis.* (Pl. IX. fig. 2.)

Testa elongata, pallide lilacea, hic illic fusco maculata; anfractus 8?, convexiusculi, longitudinaliter costati et spiraliter lirati, liris supra costas leviter tuberculiformibus, inter liras spiraliter striati, lineis incrementi tenuibus inter costas sculpti; anfr. penultimus et ultimus costis circiter 16 instructi; in anfract. superioribus costæ sensim rariores; ultimus in medio convexiusculus, infra contractus, liris spiralibus ad 16, quam costis gracilioribus, ornatus; costæ infra medium sensim evanescentes; apertura brevis, longitudinis totius  $\frac{1}{3}$  paulo superans; labrum extra late incrassatum, quasi varicosum, intus liris circiter undecim intrantibus, ad marginem denticulatum; columella supra arcuata, denticulo prope labrum munita, prope medium incisuram unicam monstrans, callo definito tuberculis 5-6 instructo amicta; canalis anterior brevis, obliquus.

Longit. 19, lat. 8 mm.; apertura 6.5 longa, 2.5 lata.

I have only seen one specimen of this species, which does not appear to approach very closely any of the known forms. The purple apex being worn, the number of whorls is rather uncertain, but probably is about eight. The broad thickening of the labrum has a large brown blotch above the middle and a smaller one below, and the spire is blotched at intervals with the same colour. The notch on the columella is only slight, but is probably a constant feature.

This and the following species are placed in the genus *Tritonidea* for want of a better location, since this group and *Cantharus* require urgent revision.

*Tritonidea rosacea.* (Pl. IX. fig. 3.)

Testa parva, fusiformi-ovata, pallide rosacea; anfractus 6?, convexiusculi, costis septem crassis, albidis, rotundatis instructi, liris spiralibus alternatim majoribus (in anfractu penultimo 8-9, in ultimo circiter 18) cincti, inter liras tenuissime spiraliter striati; costæ in anfr. ultimo ad basim continuæ, paucae antice conspicue nodulosæ; apertura parva, ringens; labrum incrassatum, dentibus validis quatuor intus armatum; columella in medio intus incisa, callo definito induta, supra marginem externum tuberculis quatuor munita; canalis anterior brevis, obliquus.

Longit. circiter 13, diam. 6.5 mm.; apertura intus 5 longa, 2 lata.

Characterized by its rosy colour, strong costæ, and dentate aperture. There is a slight sinus above the posterior denticle

on the labrum, which is larger than the three others. The denticles on the inner lip correspond to the terminations of spirals around the lower part of the whorl. The notch on the inner edge of the columella is smooth and situated opposite the second denticle from the anterior end.

*Calliostoma roseopictum*. (Pl. IX. fig. 4.)

Testa parva, conica, anguste umbilicata, maculis roseis et albis picta, superne virescens et pallide cornea, ad basim lineis tribus concentricis roseis aliisque radiantibus ornata; anfractus sex, superiores tres convexiusculi, læves, dilute carnei, duo sequentes plani, subvirides, roseo plus minus picti, ultimus ad peripheriam rotunde angulatus, roseo alboque articulatus; ultimus et penultimus spiraliter regulariter striati, striis vel sulcis sex angustissimis, quam interstitiis longe angustioribus; basis infra angulum convexiuscula, versus umbilicum angustum album magis tenuiter concentricè striata; columella oblique arcuata; labrum intus incrassatum, album; apertura intus margaritacea, obsolete sulcata.

Alt. 4·3, diam. 3 mm.

The specimen here described, although very small, appears to be adult, since the outer lip is thickened within. The thread-like sulci upon the spire and the three upon the base are coloured, and contrast clearly with the ground-colour of the shell. The former are brownish and the latter more rosaceous.

The spotted lira at the periphery passes up the spire, forming a distinct margination beneath the suture.

This species is evidently closely allied to *C. marmoreum*, Pease, from the Paumotu, and may eventually prove to be a small, less elongate, and differently coloured variety of it.

EXPLANATION OF PLATE IX.

Fig. 1. *Engina fuscolineata*, sp. n.

Fig. 2. *Tritonidea difficilis*, sp. n.

Fig. 3. — *rosacea*, sp. n.

Fig. 4. *Calliostoma roseopictum*, sp. n.

L.—*Some Notes on the Parasitic Copepod Thersitina gasterostei*, Paysonstecher. By ROBERT GURNEY, M.A.

[Plates X.-XIII.]

THE family Ergasilidæ, to which *Thersitina* belongs, has recently been most ably monographed by Wilson\*, so far,

\* C. B. Wilson, Proc. U.S. Nat. Mus. xxxix. 1911, pp. 263-400.

at all events, as concerns the North-American species ; but it appears that the genus *Thersitina*, which he was unable personally to examine, is still involved in some obscurity, owing to conflicting statements as to the structure of the single species, *T. gasterostei*. As I have had the opportunity of obtaining abundant material of this species, it seems worth while to give some account of its structure and life-history.

### Occurrence.

*Thersitina gasterostei* is found in abundance under the gill-opercula of sticklebacks (*Gasterosteus aculeatus*) in the ditches containing somewhat brackish water in the neighbourhood of Yarmouth, but I have never found it in quite fresh water. It seems to show a decided preference for the three-spined stickleback (*G. aculeatus*), so that, in a ditch in which every specimen of that species is infested, many specimens of the ten-spined stickleback (*G. pungitius*), though the commoner of the two, may have no parasites at all, and it never has so many as the other species. On *G. aculeatus* I have found as many as forty specimens of *Thersitina* under one operculum, and it is not uncommon to find one operculum smothered with the parasites while the other is nearly free from them. The parasite is found under the posterior part of the gill-operculum, clasping the mucus which covers the skin, but not apparently fixed to the skin itself. When specially numerous, specimens may be found attached to the mucus of the gills themselves, and I have even found them clinging to the pectoral and dorsal fins and to the tail.

### Breeding Periods.

Towards the end of October the adult females found are without egg-sacs and usually the ovary is also empty ; but a large number are immature, not having reached the swollen condition of the adult. It seems probable that the adults do not survive the winter, and it is very noticeable that the number of adults found decreases from August onwards. I believe that the last generation of young, hatched about the beginning of October, fix themselves towards the end of the month, and pass the winter and early spring in a more or less dormant condition. All the evidence points in this genus, as in *Ergasilus*, to the conclusion that the female is fertilized once and for all during the free-swimming stage. I have never once found a male beneath the operculum of the host, but I have seen spermatophores attached to a free-swimming



female. The large size of the receptaculum seminis also seems to confirm this conclusion. No males are to be found at the time when reproduction first becomes active in the spring, so that the spermatozoa must remain alive within the female for about five months.

I have no observations for November or December, but in January neither larvæ nor egg-bearing females are to be found. Reproduction first becomes active about the beginning of March, and continues throughout the summer. There seems to be a distinct periodicity, indicating, as I believe, a series of five generations within the year, though, of course, these generations will to some extent overlap and obscure one another. I suppose that a mature female lays two, or perhaps three, lots of eggs, and then dies and gives place to the new generation. The general course of events is, I think, as follows:—

- January.—Period of rest. No eggs. No larvæ.  
March.—Reproductive period begins. Nauplii to be found, but no later larvæ.  
April.—Larvæ mature, and fix themselves towards end of month.  
May.—Disappearance of the winter generation? Egg-laying of new (first) generation hatched in April.  
June.—Fixing and maturing of adults continue and some begin to hatch eggs.  
July.—No observations, but probably the second generation hatched in June breed and their larvæ mature.  
August.—Third generation fix and produce young, so that at end of month the fourth generation is nearly ready to fix.  
September.—No observations. Probably fixing and ripening of fourth generation.  
October.—Fourth generation still living, but ceasing to breed. Fifth generation fixing and beginning to mature.  
November and December.—No observations. Probably a resting period, without production of eggs.

### *Structure of the Adult.*

The general form of the adult female has already been adequately described \*, but no account of the male has, so far as I am aware, been given. The male described and

\* Scott, Eighteenth Ann. Rep. Fishery Board for Scotland, part iii. 1900, p. 146.

figured by Kröyer is an adult female in the free-swimming stage.

The male (Pl. XII. fig. *a* and Pl. XIII. fig. *f*) closely resembles the free-swimming female, but is readily distinguished from it by the possession of the large sickle-shaped maxillipedes and the form of the abdomen, the genital segment generally having a refringent appearance, owing to the contained spermatophores. The body is also somewhat more slender and the abdomen longer. The first thoracic segment is fused with the head, but the succeeding four segments are all distinct. The abdomen consists of five segments, the genital segment being as long as the remaining four together and bearing a seta on either side at its posterior angles. The fourth segment has a ventral ring of cilia. The furcal rami are, as in the female, short and conical, bearing a very long seta and three short subequal ones with a very characteristic arrangement (Pl. XIII. fig. *f*). In the free-swimming female the abdomen consists of four segments only, and the openings of the oviducts on the dorsal surface are very conspicuous. The appendages of the male do not differ from those of the female, with the exception of the presence of the maxillipede.

### *The Appendages.*

*First pair of antennæ.*—Unlike *Ergasilus*, the first antenna of *Thersitina* consists of five distinct joints, of which the proportional length is, on an average, as follows:—

Joints.....	1	2	3	4	5
Length .....	16	7	8	6	5

The joints bear numerous very transparent setæ, one of which, on the posterior face of the third joint, is conspicuously long.

*Second pair of antennæ.*—These are strong prehensile appendages composed of four joints, the last joint being in the form of a strong claw with a stout accessory claw at its base. In the male the whole appendage is more slender than in the female and the accessory claw is very small.

*Mouth-parts.*—The mouth-parts are exceedingly difficult to follow out even in the larva, owing to their minuteness and crowded position, and there seems to be no adequate published account of them. I have found it best to boil the adult female in caustic potash before examination, since it is then comparatively easy to see the appendages in their natural positions. There are then visible three pairs of

appendages—mandibles, first maxillæ, and second maxillæ (Pl. XI. fig. *c*).—but in the male a pair of maxillipedes are also present (Pl. XI. fig. *a*). The mandibles are strong wedge-shaped organs with a toothed cutting-plate and an accessory toothed lobe running upwards into the mouth. This lobe is overlung by the free edge of the labrum, which is a delicate plate largely fused with the cuticle of the head.

The first maxillæ are very rudimentary, and consist of a pair of minute knobs bearing three short spines (Pl. XI. fig. *d*).

The second maxillæ consist of a large basal part, divisible into two joints, and a distal curved joint with a toothed end (Pl. XI. fig. *e*). This distal joint is very freely movable, and can generally be seen in active movement when the living animal is examined.

The maxillipedes appear first in the last larval stage of the male as a pair of simple knobs, and are fully developed at the next moult. In the adult male the maxillipede is three-jointed, the first joint fused with the head, but the other two freely movable. The second joint is broad and armed with a row of small spines, and the distal joint is a long curved clasping rod, sometimes showing an apparent division at the base into two joints.

According to Dr. Scott, the mouth-parts consist of mandibles, maxillæ, and two pairs of "maxillipedes"; and in his more recent account\* he appears to confirm his original description.

I have examined a number of specimens, and have in no case found more than three pairs of appendages in the female, so that it is clear that these appendages do not differ in number or position from those of *Ergasilus*. Wilson (1911, p. 283) has given reasons, with which I fully agree, why the two pairs succeeding the mandibles should be designated as maxillæ and the pair following them in the male as maxillipedes or thoracic appendages. A full discussion of the mouth-parts of *Thersitina* and *Ergasilus* will be found in Wilson's paper.

*The swimming-legs.*—The first three pairs of legs have both rami three-jointed and of approximately the same length. The two basal joints are very broad and the legs of each pair are united by a strong chitinous bar attached at its ends to the first basal joint. The second joint bears a seta on its outer face and two rows of small spines on its inner edge.

\* 'British Parasitic Copepoda' (Ray Society, 1913), p. 42.

The outer edge of the joints of the inner ramus is fringed with a row of delicate spines. The numbers of setæ borne by the different joints are shown in the following table:—

Joints.	Leg 1.		Leg 2.		Leg 3.		Leg 4.	
	R.E.	R.I.	R.E.	R.I.	R.E.	R.I.	R.E.	R.I.
1....	—	1	—	1	—	1	—	1
2....	1	1	1	2	1	2	5	2
3....	5	4	6	4	6	4	—	4

The fourth pair have the outer ramus two-jointed and shorter than the three-jointed inner ramus.

The fifth pair of legs are simply small knobs bearing a single terminal seta.

Wilson states (1911, p. 271) that in males and immature females of the *Ergasilidæ* a pair of rudimentary legs are to be found on the genital segment, but I have not found any trace of them in *Thersitina* at any age or in either sex.

#### *Internal Anatomy.*

The internal structure, so far as I have been able to study it, does not differ from that of *Ergasilus* as described by Wilson. The only point in which there appears to be any important difference is in the nervous system. I have not been able to follow its arrangement in the adult female, but in the free-swimming female and in the male the greater part of it is fairly easy to see. Whereas in *Ergasilus* there is, according to Wilson, a double ventral nerve-cord with ganglia corresponding to each of the swimming-legs and an additional ganglion in the genital segment, in *Thersitina* the nerves of the first three pairs of swimming-legs arise from the posterior angles of the great postœsophageal ganglion, which also sends off a pair of slender cords which run back parallel and close to each other for a considerable distance before sending off nerves to the fourth pair of legs and continuing on into the genital segment (Pl. XIII. fig. *e*). I have not been able to detect any separate thoracic ganglia.



*Larval Stages.*

The nauplii can readily be obtained by isolating females with very advanced eggs, but the eggs will not hatch when so isolated unless the nauplii are already visible and active within them. The nauplii will live for some time in water not specially aerated, but I have not been able to keep them thus up to the Cyclopid stage. No doubt it would be easy to keep them to maturity with a proper system of aeration. Unfortunately my water-supply does not admit of a satisfactory arrangement.

*The First Nauplius.*

When first hatched the nauplius is of the usual Cyclopid form and only .11 mm. in length. It is very transparent, but has conspicuous blue pigment round the gut (Pl. XII. fig. 2).

The first antennæ are two-jointed, with a single seta at the apex of the first joint and two setæ of unequal length at the apex of the second joint.

The second antenna consists of a stout stem bearing a minute one-jointed endopodite and a large exopodite with a row of six setæ. The stem is constricted, though not segmented, into two joints, and has a large masticatory hook at its base.

The mandible consists of a broad basal segment and two short branches. The endopodite is indistinctly two-jointed, the basal joint bearing a large masticatory lobe armed with two stiff setæ. The distal joint bears three setæ and a large thick æsthete. The distal end of the body is provided with the usual pair of setæ. The anus is apparently imperforate.

*The Second Nauplius.* (Pl. XII. fig. 3.)

Six days after hatching the nauplii showed very little change. The length was .16 mm., or a growth of .05 mm.

The appendages remain as before, except that in the case of the mandible the exopodite is distinctly three-jointed and the endopodite has the appearance of a simple masticatory appendage of the basal joint. It consists of the previous masticatory lobe and a minute knob bearing the large æsthete and three setæ. Behind the mandible are seen beneath the skin the rudiments of a fourth pair of appendages. The posterior end of the body has now two pairs of setæ.

The antennal gland is present in the form of a long slender tube running back behind the mandible and returning on

itself to open at the base of the second antenna. The anus is still imperforate.

*The Third Nauplius.* (Pl. XII. fig. 4.)

Seven days after the nauplii had entered the second stage some were found to have moulted into a third stage and to measure about .17 mm. In this stage the first three pairs of appendages are practically unchanged, but a fourth pair is now present in the form of simple cylindrical processes with a single apical seta. These appendages may represent the second pair of maxillæ. The anus still appears to be imperforate. The blue colour surrounding the gut is now, and remains in later stages, a distinctive and easily recognized character. The maxillary gland is first seen at this stage.

*Later Nauplii.*

After the stage described above all my nauplii died off with the exception of one individual which, one month after hatching, had reached a size of .25 mm., but had no more appendages than before. In this stage the first antennæ have numerous setæ and are distinctly three-jointed (Pl. XII. fig. 5). The second antenna differs from the preceding stage in having two basal masticatory hooks instead of one, while the mandible has lost the characteristic flat æsthete of the inner ramus. At some distance behind the mandible is a fourth appendage in the form of a bilobed plate bearing six setæ. Immediately behind this appendage a line is seen across the body which marks the division between thorax and abdomen, so that this appendage is evidently the second maxilla, and not a thoracic appendage. I have not been able to find any trace of a first maxilla. Further back the first pair of swimming-legs can be faintly seen beneath the skin in some specimens.

I have not found any nauplii either larger than the one here described or with any additional appendages, so that it seems probable that this, the fourth, Nauplius stage changes directly into the first Cyclopid stage.

*Cyclopid Stages.*

Between the last nauplius found and the free-swimming adult condition I distinguish five stages, probably corresponding to as many moults. As figures are given of these stages, it is only necessary to add a short summary of the changes that characterize them.

Stage 1. First Cyclopid (Pl. XIII. fig. *a*) :

Antenna 1 indistinctly four-jointed.

Antenna 2 five-jointed as in the adult, but without accessory claws.

Mandibles and maxillæ as in the adult.

Leg 1 with indications of two joints in each ramus.

Leg 2 with one-jointed rami.

Leg 3 simple papillæ.

Leg 4 indicated beneath the skin.

Body : four thoracic segments distinct ; posterior region unsegmented.

Stage 2 (Pl. XIII. fig. *b*) :

Antenna 1 distinctly four-jointed.

Antenna 2 and mouth-parts as before.

Legs 1 to 3 with two-jointed rami.

Leg 4 simple papillæ.

Body : five thoracic segments distinct ; abdomen unsegmented.

Stage 3 (Pl. XIII. fig. *c*) :

Antennæ and mouth-parts as before.

Legs 1 to 3 with two-jointed rami.

Leg 4 with rami one-jointed.

Leg 5 indicated by a seta, but no papilla.

Abdomen of two segments.

Stage 4 (Pl. XIII. fig. *d*) :

First differentiation of sex.

Appendages as before, with the exception that the fifth pair of legs is present and in the male the maxillipede is present as an unjointed papilla.

Abdomen three-jointed (Pl. XII. fig. 1, *a*, *a'*).

Stage 5 (Pl. XIII. fig. *e*) :

In the male maxillipede with indication of joints.

In both sexes leg 4 two-jointed.

Abdomen four-jointed (Pl. XII. fig. 1, *b*, *b'*).

In the female the first abdominal segment has increased in size.

Stage 6 (Pl. XIII. fig. *f*, ♂):

Free-swimming adult.

In both sexes the adult form is assumed for all appendages, and the abdomen in the male becomes five-jointed.

### *Systematic Position.*

Wilson\* has already discussed the relationship of *Thersitina* and *Ergasilus*, and has come to the conclusion that the two genera are distinct; and with this conclusion I am in agreement. The differences between the genera are, however, very small, the most important being the inclusion of the second thoracic segment in the globular cephalothorax of the adult female and the structure of the antennæ. The mouth-parts differ somewhat in structure, but are the same in number as in *Ergasilus*.

The genus contains but one species, *T. gasterostei* (Pagenstecher), since *T. biuncinatus* (Gadd) is certainly indistinguishable from it.

### EXPLANATION OF THE PLATES.

#### PLATE X.

*Thersitina gasterostei*, mature female. Leg 1 on right side and legs 2 and 3 on left omitted.

#### PLATE XI.

*Fig. a.* Ventral view of male (adult).

*Fig. b.* Ventral view of female (free-swimming adult).

*Fig. c.* Mouth-parts of adult egg-bearing female. The second maxilla of the right side removed and the first maxilla somewhat displaced.

*Fig. d.* First maxilla isolated.

*Fig. e.* First and second maxillæ isolated.

#### PLATE XII.

*Fig. 1.* Abdomen of larva in stage 4 and 5. *a, a'*, stage 4, male and female; *b, b'*, stage 5, male and female.

*Fig. 2.* First Nauplius immediately after hatching.

*Fig. 3.* Second Nauplius six days old.

*Fig. 4.* Third Nauplius eleven days old.

*Fig. 5.* Fourth Nauplius.

#### PLATE XIII.

*Figs. a-e.* Five Cyclopid stages.

*Fig. f.* Adult male.

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\* Wilson, Proc. U.S. Nat. Mus. xxxix. 1911, p. 349.



II.—*Synopsis of the Melolonthid Genus Ancistrosoma, with Descriptions of new Species and an allied new Genus.* By G. J. ARROW.

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THE species of *Ancistrosoma* were reviewed by Sallé in 1886 (Ann. Soc. Ent. France, p. 465), and corrections of his classification were published by himself in the following year (Bull. Soc. Ent. France, 1887, p. 127) and by Brenske in 1890 (Wien. ent. Zeit. ix. p. 138). Sallé regarded *A. vittigerum*, Er., as identical with *A. flavovittatum*, Bl., while Brenske declared it to be a distinct species; but neither has distinguished it from *A. klugi*, Curtis, from which Erichson separated it only by the occurrence of a pair of setose spots on the pronotum. As this is a variable feature in *A. klugi*, I see no reason to doubt that Erichson's two forms are conspecific and both belong to *A. klugi*. The study of the genitalia shows this insect, which ranges from Ecuador to Bolivia, to be a very variable one; but in the British Museum collection I have found specimens from the Fry Collection, not separated from it and occurring like it in Peru, which certainly belong to another yet undescribed species. Other specimens in the collection are also undescribed, and as two of them are of economic importance, I have thought it opportune to prepare a synoptical revision of the genus. The most remarkable feature of the genus is the ventral spine at the base of the abdomen of the males; and it is a curious fact that in many females a definite corresponding patch is found denuded of setæ near the end of the suture, whilst in fresh specimens it is absent.

Sallé gives as a specific character of *A. melolonthoides* (of which the type has been kindly lent me by M. Oberthür) the bifurcation of the claws of the middle and hind feet; but it seems probable that this applies to the male alone, and that, as occurs in all the other species, all the claws are bifid in the female.

The species can be distinguished as follows:—

Elytra with setose sulci; front and middle claws of ♂ simple.

Elytral setæ dark coloured. . . . . *rufipes*, Latr.

Elytral setæ dark and light coloured . . . . . *intermedium*, sp. n.

Second elytral stripe produced forward.

Pronotum without median line; femora

and tibiæ black . . . . . *buckleyi*, Sallé.

*Ann. & Mag. N. Hist.* Ser. 8. Vol. xii.

31

Pronotum with median line; legs red.	
Elytra with sutural line of setæ abbreviated .....	<i>klugi</i> , Curtis.
Elytra with sutural line of setæ entire..	<i>flavovittatum</i> , Bl.
Second elytral stripe abbreviated .....	<i>hilare</i> , sp. n.
Second elytral stripe absent .....	<i>blanchardi</i> , Sallé.
Elytra without sulci; front claws of ♂ simple (except in <i>A. farinosum</i> ).	
Pronotum setose, with shining bare patches.	
Dorsal setæ deep yellow; costæ not well marked .....	<i>tobagoensis</i> , sp. n.
Dorsal setæ grey; costæ well marked.	
Scutellum clothed with short setæ .....	<i>melolonthoides</i> , Sallé.
Scutellum clothed with long setæ (all claws bifid) .....	<i>farinosum</i> , Sallé.
Pronotum covered with pale setæ, with minute opaque bare spots in ♀ only .....	<i>trinitatis</i> , sp. n.

*Ancistrosoma intermedium*, sp. n. (Figs. 1, 1 a.)

Nigrum, pedibus rufis, flavo-hirtis, capite flavo-setoso, pronoto anguste flavo-cincto, linea mediana vittisque duabus fusco-setosis; scutello flavo-setoso; elytris trisulcatis, sulcis setosis, setis minutis, partis anticæ fuscis, partis posticæ flavis:

♂, clypeo bilobato, lobis brevibus, latis; processu abdominali valido, postice fortiter angulato.

Long. 27·5–30 mm.; lat. max. 11·5–12·5 mm.

*Hab.* Peru.

This has a very close resemblance to *A. klugi*, but the setæ with which the upper surface is decorated are longer and

Fig. 1.



Fig. 1 a.



Fig. 1 b.



less scale-like and not uniform in colour, those occupying the central part of the pronotum and the anterior part of the elytral sulci being almost black, while those of the marginal

line of the pronotum and the posterior part of the sulci are yellow. There is a gradation in the latter, the dark and light scales being intermixed in the middle. The species is thus intermediate between *A. klugi* and *A. rufipes*, the setae or scales upon the upper surface of the latter being of the same narrow shape but entirely dark coloured, while in *A. klugi* they are entirely light. The lobes of the clypeus are shorter and broader in the male of *A. intermedium* than in either of the other forms, and the body generally is a little stouter and less elongate. The ventral process is rather broad and strongly angulated behind near the base. The aedeagus is shown in fig. 1a and that of *A. klugi* in fig. 1b.

I do not know the female.

*Ancistrostoma hilare*, sp. n.

Fusco-brunneum, nitidum, pronoto nigro, pedibus (abdominisque plerumque extremitate) flavibus, capite toto, pronoti margine et linea minuta mediana antica, elytrorum vitta lata subsuturali, secunda multo abbreviata margineque externa postica setis vel squamis læte aurantiacis ornatis, pectore dense, pedibus segmentorumque ventralium marginibus haud dense flavo-hirsutis:

♂, clypeo acute bidentato, pygidio inflexo, setis flavis late marginato, medio levissimo, abdomine apice excavato, processu basali valido, fere recto, haud acuto:

♀, clypei margine antico subtilissime biarcuato, fere recto. pygidio leviter convexo, aequaliter setoso, linea angusta mediana denudata. Long. 26-30 mm.; lat. max. 11-12 mm.

*Hab.* Peru (ex coll. Mniszech), Colombia.

A male and two females were included in an interesting series of *Ancistrostoma* kindly submitted to me by M. René Oberthür, who, possessing the types of Sallé's descriptions, has enabled me to examine all the species of the genus hitherto known. One of the two females is the type now in the British Museum.

The setae with which this species is decorated are of a rich orange colour, and those of the pronotum and elytra assume the form of fairly large oval scales. The pronotum has only a narrow border and a trace of a median line in the anterior part. The scutellum is almost devoid of setae. The elytra have each a broad stripe near the suture, a very short one adjacent to it, sometimes a few scales representing a third stripe, and a short marginal border at the posterior part of the outer edge. It is closely related to *A. blanchardi*, Sallé, but more massively built, with larger, broader, and more

brightly coloured scales, forming a wider sutural stripe and a second one much abbreviated at each end. The third is almost or entirely lost.

*Ancistrosoma tobagoensis*, sp. n. (Figs. 2, 2 a.)

Nigrum, elytris pedibusque flavidis, setis minutis flavis fere ubique tectum, capitis, pronoti scutellique setis rufescentioribus, pronoto utrinque late denudato, areis denudatis setis sparsutis antice divisus, scutelli setis longioribus et erectis; utrisque elytris tricotatis, costis angustis, antice denudatis; pygidio linea angusta mediana denudata notato:

♂, clypeo reflexo margine antico fere recto, pygidio convexo, inflexo; segmento ventrali primo processu recto valde obliquo armato; pedum 4 posteriorum unguibus fassis:

♀, clypeo lato, levissime bilobato; pygidio brevi, planato; unguibus omnibus fassis.

Long. 18-20 mm.; lat. max. 8-9 mm.

*Hab.* Tobago.

This is very easily recognizable by the deep yellow (orange-yellow in the anterior part) colour of the setæ with which almost the whole surface is covered, except the large, smooth, lateral patches of the pronotum. The setæ are

Fig. 2.



Fig. 2 a.



smaller and less elongate than in *A. trinitatis*. The head, scutellum, elytra, and lower surface are closely clothed with them, the three costæ of each elytra forming denuded lines, which are so narrow as to be quite inconspicuous to the naked eye except at the anterior end. The humeral and



apical callosities are also denuded. The pronotum has a border and a longitudinal median band of orange setae, and the large, smooth, lateral patches remaining are divided anteriorly by an irregular patch of setae projecting backwards from the front margin on each side. The pronotum is rather transverse, with all four angles acute and the sides strongly bent in the middle. The clypeus is only very minutely notched in the middle in the female, straight and reflexed in the male. The basal ventral segment of the latter is armed with a nearly straight process directed obliquely backwards.

Specimens were taken in numbers by Mr. W. E. Broadway, who found them destroying the young foliage of the mountain Immortelle (*Erythrina*) in June of this year.

*Ancistrosoma trinitatis*, sp. n. (Figs. 3, 3 a.)

Testaceum, corpore supra setis pallide flavis, subtus setis griseis ubique sat crebre vestito, pedibus minus dense flavo-pilosis, clypeo antice fere recto; pronoto transverso, antice modice angustato, lateribus medio leviter angulatis, angulis anticis fere rectis, posticis acute productis; scutello setis ut in dorsi reliquo vestito, elytris costis angustis vix nudis instructis:

♂, clypeo leviter reflexo, utrinque obtuse angulato; pygidio inflexo, convexo, linea brevi longitudinali mediana levi ornato, segmento ventrali primo medio minute producto vel spinoso, pedum 4 posticorum unguibus fissis:

♀, pronoto postice plagiis minutis duabus denudatis subopacis instructo; pygidio brevi planato; unguibus omnibus fissis.

Long. 17-20 mm.; lat. max. 8-9 mm.

*Hab.* Trinidad.

This insect has the generic features at their lowest development. Almost the whole surface is covered with narrow scales or setae, the elytral costae, although denuded on the summit, being very narrow and not conspicuous. The clypeus is not bilobed, but nearly straight at the front margin. The general form and size are those of *A. farinosum*, but a little less elongate, and the pronotum is rather broader, less narrowed in front, and less angulated at the sides. The scutellum is clothed, except at its edge, with setae only a little longer than those of the pronotum and elytra.

♂. The abdomen is strongly arched and the legs are slender. The front margin of the clypeus is gently excised and the angles rather sharply marked. The first abdominal segment is produced in the middle as a minute spine, but in

small individuals this is almost or entirely obsolete. The pygidium is long and incurved, and bears a narrow, longitudinal, smooth line. The front claws are simple and the rest cleft.

♀. The abdomen is short and stout and the legs are much shorter than those of the male. The clothing of the

Fig. 3.

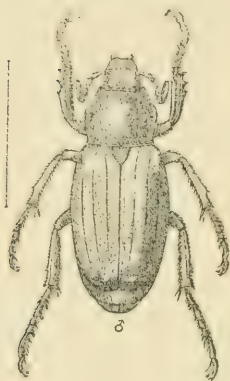
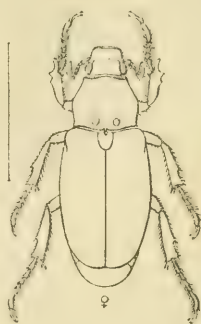


Fig. 3 a.



upper surface is a little less dense, the setæ being rather less numerous. There is a small, round, denuded patch on each side of the base of the pronotum; the pygidium is short and rather flat, and the claws are all cleft at the tip.

It appears to be common in Trinidad, and was found by Mr. F. W. Urich eating leaves of the cacao-tree in May.

#### PECTINOSOMA, gen. nov.

Corpus angustum, attenuatum. Caput parvum. Oculi haud prominentes. Clypeus brevis, margine antico recto. Antennæ 9-articulatæ. Pronotum hexagonum, elongatum. Prosternum posticè oblique productum, utrinque planatum, apice bifidum. Pedes graciles; coxæ intermediae et posticæ late distantes; tibiæ anticæ haud fortiter bidentatæ; tarsi omnes sat longi et crassi, singulo apice pilis 4 longis divergentibus instructo; ungues longi, integri. Metasternum et abdomen subtus late excavati, hujus segmentum penultimum lamina horizontali postice minute dentata munitum.

#### *Pectinosoma elongatum*, sp. n. (Figs. 4, 4 a.)

Nigrum, clypeo, elytrorum marginibus anguste pedibusque castaneis; corpore supra opaco, minute nigro-setoso, marginibus extremis omnibus, scutello, suturaque, setis albis multo majoribus

ornatis; capite parvo, rude et confluent punctato, oculis haud prominentibus, clypeo brevi, antice fere recto; pronoto convexo, angulis anticis acutis, posticis obtusis, lateribus medio valde angulatis; elytris dense punctatis et setosis, vix costatis; propygidio longo, eodem modo sculpturato, pygidio longo, antice nitido, parce punctato, postice crebre punctato et flavo-setoso. Long. 17 mm.; lat. max. 6 mm.

*Hab.* BRITISH GUIANA: Mt. Roraima.

Although I know only the male of the insect for which this genus is formulated, its characteristics are so peculiar and striking that no other course is possible than to so deal with it, while its close relationship to *Ancistrosoma* is equally evident.

Fig. 4.



Fig. 4 a.



The body is exceedingly elongate and the last two abdominal segments are entirely uncovered by the elytra. The middle and hind coxæ are widely separated and the thorax and abdomen alike are hollowed out to the full width of their ventral surface. The prosternum forms a conspicuous bifid process behind the front coxæ. The whole of the lower surface, with the exception of the last segment of the abdomen, is clothed with short yellowish hair, which becomes long and thick round the edges of the hollowed surface. The penultimate segment bears a rectangular process directed horizontally backwards. The straight posterior edge of this process bears a row of very short broad bristles, twelve in number, placed in close contact and truncated at the end, presenting the appearance of a set of incisor teeth. This curious comb-like appendage arises beyond the middle of the segment, which is excavated beneath it and projects only a little way beyond its hind margin. The terminal segment

is smooth, broad, and truncated at the end. The clypeus is short, with its front edge straight and slightly reflexed. The antennæ are 9-jointed. The pronotum is distinctly longer than wide and greatly contracted in front and behind, without the tooth in the middle of the hind margin and corresponding notch in the scutellum so characteristic of *Ancistrosoma*. The legs are long, slender, and thinly clothed with long hair, the front tibiæ bearing two rather feeble teeth. The claws are simple, long, and slender, and each claw-joint bears at the end four very long fine hairs, placed at equal distances round the base of the claws and pointing outwards.

Many of these features are no doubt peculiar to the male sex.

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LII.—*New minute Terrestrial and Aquatic Mollusca from the Dutch East Indian Island of Beilan-Beilan, with Descriptions of Four new Genera and Subgenera.* By H. B. PRESTON, F.Z.S.

THE islet of Beilan-Beilan, in which the species of which diagnoses are below given were collected, is situated to the north of Great Obi or Ombirah Island, in lat.  $1^{\circ} 20'$  S. and long.  $127^{\circ} 27'$  E. Through the great kindness of the owner, Mr. Diepenheim, two bags of dead leaves were received from this island, which, when thoroughly sifted, were found to contain a very large number of mollusca, in the sorting of, and search for, which the author has been greatly assisted by his indefatigable friend Mr. T. Iredale.

In addition to the species here enumerated, pieces of several large species (probably Helicoids) were also discovered, but these were of a far too fragmentary nature to allow of recognition or description.

As the island, originally covered with jungle, is destined to be cleared and planted with coconuts, it is to be feared that, if not all, at any rate the greater part, of these interesting species are doomed to extinction at an early date.

In the present paper no figures are given, but it is hoped by the author to write further papers on the island, when this will be duly done.

*Charopa moluccensis*, sp. n.

Shell (as seen under a 1-inch objective) minute, orbicular,



very depressed, almost planulate, dark reddish brown, glossy; whorls 3, regularly increasing, angled above, sculptured throughout with fine, closely set, transverse costulae, crossed by fine spiral striae, which are especially noticeable on the first whorl and a little beyond; suture deeply impressed, wide, rather deep; columella margin descending in a slight curve; labrum simple, the margins converging; aperture broadly and slightly oblique, suberescence.

Alt. .5 (nearly), diam. maj. 1 mm.

*Hab.* Island of Beilan-Beilan, to the north of the Obi Islands, Dutch East Indies (*Mr. Diepenheim*).

BEILANIA, subgen. n. (*Ptychodon*).

Shell depressed, orbicular, widely umbilicate, bearing two horizontal lamellae on the lower portion of the parietal wall; outer wall edentulate; apical whorls (as seen under a 1-inch objective) spirally striate.

*Hab.* Moluccas.

Genotype. *B. inopina*, Preston.

This and the preceding species considerably extend the known range of the *Endodontidae*.

*Beilania inopina*, sp. n.

Shell (as seen under a 1-inch objective) minute, orbicular, subplanulate, chocolate-coloured; whorls nearly 4 in number, the first whorl and a half spirally, punctately lirate, the remainder coarsely, moderately distantly, and slightly arcuately, transversely costulate, the interstices bearing very fine and closely set transverse striae, crossed by still finer spiral striae, thus presenting a minutely cancellate appearance, the last whorl a little descending in front; suture rather deep; umbilicus very wide; aperture ovate, armed below the periphery with two coarse, erect, entering lamellae on the parietal wall; labrum simple, the margins converging.

Alt. .75, diam. maj. 1.75 mm.

*Hab.* Island of Beilan-Beilan, to the north of the Obi Islands, Dutch East Indies (*Mr. Diepenheim*).

DIEPENHEIMIA, gen. nov.

Shell heliciform, corneous, perforate, having a widely grooved suture, which is continued on the last whorl as a suprapерipheral channel.

*Hab.* Moluccas.

Genotype. *D. iridescens*, Preston.

The author has much pleasure in dedicating the present genus to Mr. Diepenheim, through whose good offices, as explained in the opening lines of this paper, all the species described herein were obtained.

Both the above new genera, judging by the shell-characters alone, should be placed in the family *Zonitidae*.

*Diepenheimia iridescens*, sp. n.

Shell (as seen under a 1-inch objective) perforate, small, suborbicular, depressedly conoid, yellowish brown, corneous, polished, shining, highly iridescent; whorls 4, regularly increasing, the last gradually and slightly descending in front, channelled and carinate just above the periphery; apical whorls smooth, the later whorls marked with radiate growth-lines and sculptured with indistinct, rather closely set, spiral striæ; suture narrowly, callously margined above, deeply and rather widely channelled below, the sutural channel being continued as the supra-peripheral channel on the last whorl; base of shell somewhat inflated, bearing the same sculpture as on the spire; umbilicus narrow, deep; columella margin descending in an angular curve; labrum acute, notched at the termination of the supra-peripheral channel; aperture very obliquely subcrenate.

Alt. 1.25, diam. maj. 2.75, diam. min. 2.5 (nearly) mm.

*Hab.* Island of Beilan-Beilan, to the north of the Obi Islands, Dutch East Indies (*Mr. Diepenheim*).

*WILHELMINAIA*, gen. nov.

Shell corneous, turbate, perforate, sculptured throughout with very fine, spiral, punctate striæ.

*Hab.* Moluccas.

Genotype. *W. mathildæ*, Preston.

*Wilhelminaia mathildæ*, sp. n.

Shell (as seen under a 1-inch objective) minute, globosely but rather depressedly turbate, polished, shining, pale brown; whorls nearly 4 in number, regularly increasing, sculptured with fine, punctate, spiral striæ, crossed by fine, regular, transverse, hair-like growth-striæ, which are more closely set on the earlier whorls; suture rather lightly impressed, margined above; base of shell somewhat convex; umbilicus extremely narrow; columella margin very obliquely descending, slightly curved, and outwardly dilated; labrum simple; aperture oblique, subcrenate.

Alt. 1, diam. maj. 1.5 mm.

*Hab.* Island of Beilan-Beilan, to the north of the Obi Islands, Dutch East Indies (*Mr. Diepenheim*).

*Wilhelminaia minuscula*, sp. n.

Shell (as seen under a 1-inch objective) very minute, turbinate, reddish brown, somewhat shining; whorls 4, regularly increasing, sculptured with extremely fine, wavy, spiral, punctate striae crossed by fine transverse striae; suture impressed, margined *below*; perforation reduced to a mere chink; columella vertically descending above, then angled and very oblique below, outwardly dilated; labrum simple; aperture very oblique, sublunate.

Alt. .5, diam. maj. 1 mm.

*Hab.* Island of Beilan-Beilan, to the north of the Obi Islands, Dutch East Indies (*Mr. Diepenheim*).

The species is, in many respects, a miniature of *W. mathildae*.

*Opeas diepenheimi*, sp. n.

Shell (as seen under a 1-inch objective) imperforate, fusiformly cylindrical, with obtuse apex, yellowish white; whorls 6, the first much flattened above, the second very large in proportion, the remaining four convex, the apical whorls shining, sculptured with exceedingly fine, wavy, spiral striae, the later whorls closely and finely transversely costulate; suture well impressed; columella vertically descending above, obliquely below, slightly bulging in the median part, narrowly outwardly reflexed, and diffused above into a narrow, somewhat restricted, and moderately well-defined parietal callus which reaches to the upper margin of the labrum; labrum acute, a little dilated below, bent slightly inwards over the aperture above; aperture inversely auriform.

Alt. 5, diam. maj. 2 mm.

Aperture: alt. 1.5, diam. .5 mm.

*Hab.* Island of Beilan-Beilan, to the north of the Obi Islands, Dutch East Indies (*Mr. Diepenheim*).

HENDRIKIA, subgen. n. (*Scarabus*).

Shell minute, narrowly perforate, with excentric, mamillary, corneous, nepionic whorls, of which the second is densely spirally pitted.

*Hab.* Moluccas.

Genotype. *H. mirifica*, Preston.

*Hendrikia mirifica*, sp. n.

Shell (as seen under a 1-inch objective) minute, laterally compressed, ovate, with turrite, exserted spire, the nepionic whorls greyish, the remainder dark chestnut, the last ornamented with three broad spiral bands of a pale brownish colour; whorls 7, the first two mamillary, the third small; the fourth, fifth, and sixth regularly increasing, the seventh large; the last five whorls sculptured with moderately closely set, transverse costulae which in places appear to be pitted; suture impressed; umbilicus very narrow; columella margin outwardly curved, broad; labrum simple; aperture slightly oblique, narrow, elongate, bearing on the parietal wall an elongate tooth, and a large depression just below the median part, below which is situate a hollow and rather deep lamella-like tooth entering the shell at right angles to the tooth above; the columella is armed with a broad, entering, and somewhat concave lamella, and below this a projection which entirely bars the extreme base of the aperture, while on the inner margin of the outer lip are situate five denticles, of which the first and fourth from above are very small (the latter being rather more interiorly situate than the others) and the fifth or lowest the largest, with an upwardly curving tendency.

Alt. 3.25 (nearly), diam. maj. 2 (nearly), diam. min. 1.25 mm.

Aperture: alt. 1, diam. .5 mm.

*Hab.* Island of Beilan-Beilan, to the north of the Obi Islands, Dutch East Indies (*Mr. Diepenheim*).

*Melanopsis dos*, sp. n.

Shell small, decollated, fusiform, ovate, dark olive, indistinctly banded on the last whorl with dark brown; remaining whorls 2, the last long, subangulate above and below the periphery, marked with fine transverse growth-plications; suture lightly impressed; columella margin vertically descending, slightly curved above, rather abruptly truncate below; labrum simple; aperture elongate, narrow above, broadening in the median part, bearing a coarse whitish callosity on the upper portion of the parietal wall.

Alt. 5, diam. maj. 2.75, diam. min. 2.5 mm.

Aperture: alt. 3, diam. .75 mm.

*Hab.* Island of Beilan-Beilan, to the north of the Obi Islands, Dutch East Indies (*Mr. Diepenheim*).



*Cyclotus beilanensis*, sp. n.

Shell rather small, depressedly turbinate, pinkish-livid, painted with an infra-peripheral band of blackish brown, and covered with a coarse, chestnut-brown, finely scabrous periostracum; whorls  $3\frac{1}{2}$ , the earlier whorls (when seen under a 1-inch objective) bearing traces of fine spiral liration and the last two rather finely, transversely costulate; suture impressed, umbilicus somewhat wide, deep; labrum simple, the margins converging, a polished, well-defined, parietal callus stretching between the two; aperture circular; operculum white, calcareous, slightly concave, multispiral, with central nucleus and obliquely, transversely laminiferous, grooved below round the outer margin.

Alt. 4.5, diam. maj. 9, diam. min. 7.25 mm.

Aperture: alt. 4, diam. 4 mm.

*Hab.* Island of Beilan-Beilan, to the north of the Obi Islands, Dutch East Indies (*Mr. Diepenheim*).

*Platyrache iredalei*, sp. n.

Shell (as seen under a 1-inch objective) small, discoidal, yellowish white below its coarse agglutination of foreign matter; whorls 3, the first two horny, considerably exserted, the last calcareous, planulate, sculptured with slightly oblique transverse costulae, all three being spirally lirate; suture impressed; umbilicus broad, open; labrum simple, acute, continuous; aperture circular; operculum calcareous, concave, laminiferous, multispiral, with smooth, central, rather shallow, cup-like nucleus.

Alt. 2, diam. maj. 5, diam. min. 3.75 mm.

Aperture: alt. 1.5, diam. 1.5 mm.

The above dimensions are calculated as far as possible to exclude the agglutinated matter.

*Hab.* Island of Beilan-Beilan, to the north of the Obi Islands, Dutch East Indies (*Mr. Diepenheim*).

*Diplommatina radiiformis*, sp. n.

Shell (as seen under a 1-inch objective) small, radiiform, rather solid, flesh-coloured above, shading to pale yellow below; whorls 7, the first five convex, regularly increasing, the sixth considerably swollen and angled at the periphery, the last decreasing in breadth and scarcely angled, the first two smooth, the remainder obliquely, transversely costulate, the interstices sculptured with slightly wavy spiral striae;

suture well impressed, coarsely crenellated by the terminations of the transverse costulæ; columella obliquely descending, bearing somewhat inferiorly a small downwardly directed denticle in its median part, and spreading above into a thick, well-defined, parietal callus, which reaches the upper margin of the labrum and gives to it a subcontinuous appearance; labrum triple, outwardly expanded and reflexed, the inner margin somewhat minutely granular; aperture circular, pale yellow; operculum unknown.

Alt. 2·5, diam. maj. 1·25 (nearly) mm.

*Hab.* Island of Beilan-Beilan, to the north of the Obi Islands, Dutch East Indies (*Mr. Diepenheim*).

*Palaina beilanensis*, sp. n.

Shell (as seen under a 1-inch objective) minute, rather shortly cylindrical, yellowish brown; whorls 5, the first very small, the second proportionately large, the third and fourth regularly increasing, the last somewhat decreasing both in length and breadth, the first three smooth, the last two obliquely costulate; suture impressed; peristome continuous, laminiferous, outwardly expanded, and reflexed, bearing two laminiferous ridges on the whorl immediately behind; aperture large, circular; operculum unknown.

Alt. 2, diam. maj. 1 mm.

*Hab.* Island of Beilan-Beilan, to the north of the Obi Islands, Dutch East Indies (*Mr. Diepenheim*).

*Diancta diepenheimi*, sp. n.

Shell (as seen under a 1-inch objective) cylindrical, but for the last whorl, yellowish flesh-colour; whorls 7, the first two very small, the third and fourth large in proportion and rapidly increasing, the fifth and sixth rapidly increasing in length but not in breadth, the seventh much smaller, contracted, and towards the aperture rapidly forsaking the direction of the axis of the shell, the two apical whorls smooth, the remainder obliquely and slightly distantly costulate, the interstices sculptured with fine, wavy, spiral striae; suture impressed; labrum continuous, tinged with a reddish-golden line, the inner margin erect, the outer outwardly expanded and reflexed; aperture circular; operculum unknown.

Alt. 3·5 (nearly), diam. maj. 1·5, diam. min. 1 mm.

Aperture: alt. ·75, diam. ·75 mm.

*Hab.* Island of Beilan-Beilan, to the north of the Obi Islands, Dutch East Indies (*Mr. Diepenheim*).

*Moussonia athena*, sp. n.

Shell (as seen under a 1-inch objective) subulately fusiform, bronze-brown; whorls 8, the first two smooth, rounded, regularly increasing, the third proportionately broader, this and the remainder strongly angled at the periphery, sculptured with very oblique transverse costulae; suture well impressed; columella margin tinged with reddish bronze, descending in a curve and considerably outwardly dilated, bearing interiorly a rather coarse, downwardly sloping, projecting tooth; labrum continuous, granular, outwardly expanded, scarcely reflexed; aperture subcircular; operculum unknown.

Alt. 2.75, diam. maj. 1 (about) mm.

*Hab.* Island of Beilan-Beilan, to the north of the Obi Islands, Dutch East Indies (*Mr. Diepenheim*).

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LIII.—*A new Variety of Polydesmus coriaceus, Porat, and Note on a Centipede Monstrosity.* By C. M. SELBIE, B.Sc.

DURING the excursions held by the Belfast Naturalists' Field Club in May of the present year, in celebration of the fiftieth anniversary of the foundation of the club, a number of Myriapods were collected and were forwarded to me for examination. Among them is a specimen of *Polydesmus coriaceus*, Porat, which belongs to a hitherto-undescribed variety.

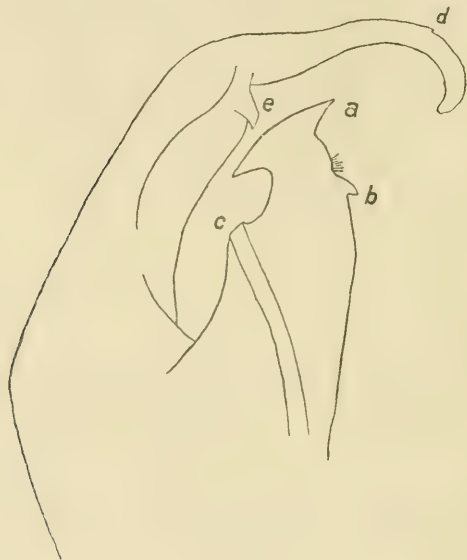
In outward appearance it agrees exactly with typical individuals of the species; it is only when the "copulatory feet" of the seventh segment are examined that any difference becomes apparent.

The most characteristic feature is the form of the extremity of the seminal branch (fig. 1, *a*). This is expanded into a broad double-edged blade shaped like a battle-axe, the two sides being quite equal and symmetrical. Beneath the opening of the seminal duct, which is furnished, as usual, with a group of bristles, there is a sharp tooth or process directed downwards (*b*); on the other side of the seminal branch, and slightly nearer the base, there is a blunt knob (*c*).

The outer branch is very similar to that of typical specimens. Near the tip it bears one small tooth on the external margin (*d*). This, however, is not likely to be a constant character, as similar teeth are sometimes present and

sometimes wanting in normal specimens. The tooth *e* near the middle of the branch is rather blunt and not very easily seen, owing to its being situated at the point where the thickening of the branch begins.

Fig. 1.



The variety, which I propose to call *P. coriaceus*, var. *securiformis*, in reference to the shape of the seminal branch, is at present represented by a single specimen taken on a log of wood at Murlough Bay, Antrim.

I am glad to have this opportunity of expressing my gratitude to Dr. H. W. Brölemann, of Pau, for valuable information with regard to the varieties of *P. coriaceus* found in France.

#### *A Peculiar Specimen of Stigmatogaster subterraneus, Leach.*

I am indebted to Prof. Carpenter, of the Royal College of Science, Dublin, for the opportunity of describing this specimen, which was sent to him recently with some others from Kilfinane, in Limerick, where they were found in potatoes.



The anterior and middle portions of the body are those of a perfectly normal specimen, but two segments in front of the last leg-bearing segment it splits into two halves, both of which are completely developed—externally, at least. The left branch is more nearly in a direct line with the rest of

Fig. 2.



the body than the right, which is slightly twisted towards the other, so that the dorsal shields are directed outwards. Each branch bears three pairs of perfectly developed legs, including the long and thin anal pair with their large inflated coxæ covered with pores. The ventral plate of the segment

where the division takes place is very broad, and serves both branches, though its larger part is on the left. Stigmata are present on both halves.

Fig. 3.



As seen from the dorsal aspect, the coalescence of the two parts is not so sudden and complete as on the lower side (*cf.* figs. 2 and 3). They are firmly joined at the second

segment in front of that which bears the anal legs, but the dorsal shields do not run completely across the body till a point three segments before this, and each of these segments bears two stigmata on the dorsally-turned pleural surfaces.

The specimen was slightly damaged before it reached me, and was not in good condition for dissection, but the main points with regard to the internal organs could be made out. The mid-gut splits a short distance in front of the division, one branch running into each half of the body. Behind the split each branch is slightly convoluted, and then continues straight. A pair of Malpighian tubes mark the division between mid- and hind-gut in the right branch, but they are absent in the left. On the other hand, though both branches have externally the appearance of belonging to a female, the internal sexual organs are present only in the left branch, and are wanting in the right. The nerve-cord sends a branch into each half of the body, the ganglion where the division takes place being more than twice as large as the others of the ventral chain.

LIV. — *Some hitherto-undescribed Ipidæ and Platypodidæ from India and Burma.* By Lt.-Col. WINN SAMPSON, F.E.S.

*Xyleborus velatus*, sp. n.

Ferrugineo-brunneus, compactus, prothorace subquadrato, rugis transversis exasperato, postice sparsim subtiliter punctato; elytris longitudinaliter pulvinato-convexis, striato-punctatis, interstitiis postice uniseriatim piliferis punctulatis, declivitate tuberculis ornata, margine apicali subtilissime carinato.

Long. 2.6 mm.

*Loc.* Tharrawaddy, L. Burma (*E. P. Stebbing*).

Reddish brown; front subconvex with the anterior half unevenly and coarsely punctured, except the centre over the mouth, which is smooth and shiny as in *X. fornicatus*, the posterior portion finely shagreened; prothorax very nearly as broad as long, with the sides narrowed slightly anteriorly before the middle, the anterior edge almost straight, the anterior and posterior angles obtusely rounded, the upper surface moderately convex, the disc being transversely elevated, the anterior part very coarsely transversely rough and having a few interspersed hairs, posteriorly very shiny

and slightly punctured; scutellum triangular, transverse, and shiny black; elytra the same breadth as the prothorax and very little longer, sides slightly rounded and the breadth decreasing somewhat to the bluntly rounded apex, longitudinally very convex, punctate-striate, the interstices with a single row of piliferous punctures almost to the declivity, from thence to the apex having uniseriate, short, and sharp-pointed tubercles, the apical margin slightly but acutely elevated; the anterior femora in some specimens are paler in colour than the tibiæ.

This species seems allied to several already described from the East Indies, but is probably nearest to *X. fornicatus*, Eichh., from which it differs in having a more convex surface, much more prominent tubercles, a difference in shape of the prothorax, &c.

*Xyleborus improbus*, sp. n.

Oblongus, subnitidus, nigro-brunneus, prothorace semigloboso, gibbo, antice exasperato, postice subtiliter punctato; clytris quam prothorace fere duplo longioribus, striato-punctatis, interstitiis subplanis, 2° biserialim, cetera uniseriatim punctatis; 2° in summa declivitate parva spina una, 3° spinis parvis ornato.

Long. 3 mm.

*Loc.* Darjeeling (*B. B. Osmaston*).

Front black, subconvex, just above the mouth are two coarsely punctured depressions separated by a slight longitudinal elevation, the posterior surface is finely reticulate; prothorax subglobose, anteriorly asperate, transversely gibbous, posteriorly finely shagreened and sparsely granulate, with a very small cluster of piliferous punctures at the centre of the base. The scutellum black, transverse, and feebly punctate. Elytra equal in breadth to the prothorax and about half as long again, subparallel-sided, with the apex somewhat bluntly rounded; striate-punctate, the punctures being variolose in character; there is a double irregular row of punctures on the second interstice up to the commencement of the declivity, where there is a short sharp spine, the declivous portion having a single row of minute punctures, each furnished with a very long hair; the third interstice has two or three small spines on the declivity, which is depressed on each side of the suture; the striæ are sinuous outwards towards the apex, which is marginate. Somewhat similar to *X. horridus*, Eichh., but most nearly allied to my species, *X. niger*, from the Ruby Mines, Burma (*Ann. & Mag. Nat. Hist.* ser. 8, vol. x., August 1912, p. 247).



*Xyleborus novius*, sp. n.

♀. Oblongus, subnitidus, nigro-piceus, prothorace subquadrato, lateribus et apice leviter singulatim rotundatis, dorso gibboso, postice sublævi; elytris lineato-punctatis, interstitiis planis, seriato-setosis, declivitate obliqua, subnitida, subtus acute marginata, striis ad apicem vix sinuatis, interstitiis granulis elevatis parvis post medium æqualiter notatis.

Long. 2.5 mm.

*Loc.* S. Malabar, Madras (*E. P. Stebbing*).

Oblong, shiny, pale piceous, sparsely hairy. Front convex, strongly punctured, with an indistinct median longitudinal line. Prothorax subquadrate, although with sides and apex slightly rounded, obtusely angled at base, anteriorly granulate-asperate, posteriorly shining and very finely reticulate and punctate. Scutellum shiny, black, and triangular. Elytra as wide as the prothorax, but hardly any longer, the sides subparallel, bluntly rounded at the apex, with a very slight acute margin; surface cylindrical to about the middle and from there obliquely declivous, the punctures shallow and variolose, and the interstices flat with uniseriate piliferous punctures, becoming tuberculate before the declivity, which is very slightly less shining than the rest of the elytra.

This species is almost exactly similar to *X. andamanensis*, Blandf., and can only be separated from the latter by its shorter and much narrower figure and the shiny and more abrupt declivity.

*Xyloterus intermedius*, sp. n.

♂. Oblongus, brunneus, pilis longis adpersis, fronte depressa, clava antennarum ovali; prothorace depresso, subtiliter asperato; elytris unicoloribus, subtiliter lineato-punctatis, interstitiis multipunctatis, apice obtuso.

Long. 3.2 mm.

♀. Oblongus, brunneus, fronte subconvexa, clava antennarum ovali; prothorace subgloboso, dorso ultra medium gibboso, antèrius exasperato, posterius subtiliter rugoso; elytris ut in mari.

Long. 3.5 mm.

*Loc.* Bashahr State, N.W. Himalayas (*E. P. Stebbing*).

*Male.*—Head brown, front slightly concave and pubescent, coarsely punctured, two depressions just above the epistoma separated by a median longitudinal carina; eyes bipartite; the antennal scape and funiculus, in most specimens, darker than the club, which is closely covered with pale pubescence,

solid, obtusely rounded apically; prothorax brown, transverse and depressed, constricted in front and without tubercles on the anterior margin, apex and sides clothed with longish hairs, the whole surface finely asperate. Scutellum bluntly triangular. Elytra the same colour as the prothorax and not quite twice as long, very slightly narrower than the prothorax at its greatest width, sides subparallel, apex obtusely rounded, surface with long hairs, especially towards the sides and apex, finely lineate-punctate, interstices irregularly and closely punctured.

*Female*.—Head brown, front subconvex and pubescent, the sculpture similar to that of the male; prothorax subglobose, apical margin bituberculate and the anterior part strongly asperate, whilst the posterior portion is only slightly rugose. Scutellum similar to that of the male. Elytra lineate-punctate, the punctures rather more distinct towards the base, interstices irregularly punctured. Underside less hairy than in the male.

From the description this species seems to be allied to *Xyloterus* (*Trypodendron*) *unicolor*, Eichl., but is broader, with more regular elytral punctuations, and having the prothorax and elytra of a uniform colour, &c. From *X.* (*Trypodendron*) *pubipenne*, Blandf., it is distinguished by its less elongate form, difference in colour, absence of anterior constriction of the prothorax in the female, &c.

*Hyorrhynchus blandfordi*, sp. n.

♂. Oblongo-ovatus, opacus, niger, pube fusco-cinereo dense vestitus, scapo funiculoque antennarum ferrugineis, capite cinereo; prothorace semiglobo, basi bisinuata, lateribus rotundatis, supra dense granulato, elytris post medium dilatatis, supra tenuiter striatis, omnino fuliginosis, interstitiis convexis, ad basin granulatis.

Long. 5·7 mm.

*Loc.* Kali Pokri, Darjeeling (*H. Stevens*).

Head produced into a flattened rostrum, expanded laterally at the apex into two broad triangular processes hollowed out on the dorsal surface, a strong central longitudinal carina extends the whole length of the head, having on each side, at the apex, an area of coarse irregular longitudinal rugosities becoming finer between the upper divisions of the eyes, which are longitudinally oval with small portions extending slightly round the sides of the head towards the under divisions of the eyes. Antennæ with the scape and funiculus ferruginous, the club large, solid, acuminate, hairy, and mouse-

brown. Prothorax widest in the middle, with a regularly and closely granulate surface, not pubescent except at the base of the well-marked longitudinal median line. Scutellum rounded, pubescent, with some minute longitudinal scratches. Elytra wider than the prothorax and more than twice as long, laterally sinuous, being broadened behind the middle and separately curved at the base; surface striate, the striae narrow and shiny, interrupted at short intervals by transverse ridges, interstices thickly clothed with dense dusky short hairs, convex, and granulate; tarsi lighter in colour than the other joints of the legs.

Very closely allied to *H. lewisi*, Blandf., but narrower and longer, with a more developed rostrum, darker in colour, which is also uniform throughout, the elytral apex more acuminate, and the antennal club dark.

*Platypus suffodiens*, sp. n.

♂. Fuscus, antennis tarsisque flavis; fronte concava, valde punctata, prothorace subquadrato, apice punctis magnis irregulariter dispersis et juxta post illos, punctorum parvorum congerie ornato; basi utrinque punctis nonnullis instructo; elytris profunde sulcatis, sulcis obsolete punctatis, interstitiis nitidis, 3° basi punctato, depressione postica subconvexa.

Long. 4·8 mm.

♀. Fuscus, fronte concava, admodum nitida, minutissime reticulata, prothorace ei maris simili, sed punctorum congerie majore ornato; elytris sulcatis, interstitiis nitidis, 3° basi granulato.

Long. 5 mm.

*Loc.* Lower Burma (*E. P. Stebbing*).

*Male*.—Front concave, roughly punctured and slightly hairy, the anterior half is paler than the posterior in some specimens, and there is a shallow central depression; the prothorax is subquadrate, with a number of large punctures placed irregularly along the anterior edge, immediately behind which there is a small patch of longitudinally elongate and confluent punctuations (in some cases this patch is separated longitudinally into two smaller ones), close behind which a shallow median groove extends longitudinally to the base, the remainder of the prothoracic surface is only very slightly punctured; the elytral furrows are deep and roughened, whilst the interstices are shining but also minutely punctured, the first is continued to the apex, becoming granular before the declivity, the second ceases before the depression, whilst the third is extended horizontally into a short blunt spine and, together with the

other interstices, forms the edge of the convex apical depression, which has a dull and roughened surface; the base of the third interstice is almost smooth, and that of the fourth ends in a few granulations, plainly visible when viewed laterally.

*Female*.—Front concave, very shiny and delicately reticulated, a bisinuous line divides the anterior portion, which is irregularly convex; from the concave posterior part there is a short median longitudinal line, and a few very long hairs arch over the front from the sides, besides some shorter ones on the vertex; just above the mouth the surface is slightly roughened and elevated; the prothorax is similar to that of the male, but the anterior patch of punctures is much larger and heart-shaped. The apical depression of the elytra is less than in the male, the horizontal portion being less abruptly separated from the declivous portion, owing to the much shorter terminal spines of the interstices; the first and second interstices are continued to the apex in the form of granules, the remainder ceasing before the depression and becoming granular from the basal two-thirds.

This species belongs to Chapuis's group *Sulcati*, in which the species *P. signatus* and *P. westwoodi* also have the prothoracic punctures placed anteriorly.

The sexes have been determined by dissection.

*Platypus rectangularatus*, sp. n.

♂. Fronte lineato-punctata et carina media ornata; fusco-testaceus, prothorace congeriebus punctorum angustatis; elytris subtiliter lineato-punctatis, interstitiis subtilissime punctatis, depressione postica lunata, angulis productis, emarginatione rectangularata.

Long. 3 mm.

♀. Fronte lineato-punctata et striga media impressa, pallide testacea, prothorace congeriebus punctorum duabus semi-ovalibus; elytris subtiliter lineato-punctatis, interstitiis vix distincto punctatis, depressione postica lunata, rugoso-punctata, foveola in utroque elytro impressa.

Long. 3.2 mm.

*Loc.* Tharrawaddy, Lower Burma (*E. P. Stebbing*).

*Male*.—Testaceous brown, the elytra becoming darker posteriorly; prothorax with about fifteen punctures on each side of the anterior extremity of the median sulcus, which does not extend quite to the base and only halfway to the apex; the rest of the prothoracic surface is furnished with punctures of irregular size and distribution; at the extreme base and apex there are small areas of fine wavy transverse



striation; elytra constricted just above the apical impression, which is vertical with an emargination of equal width above and below, lineate-punctate, with flat interstices very irregularly and remotely punctured.

*Female*.—Paler than the male, the elytra rather darker posteriorly close to the declivity; prothorax with a broad patch of punctures extending the whole length of the median sulcus, which is similar in length but much less impressed than that of the male; the rest of the surface is similar to the male. Elytra very feebly lineate-punctate, except the sutural rows, the interstices with only a few very minute punctures; the apical depression lunate with a subconcave fundus, which is rugulose and hairy.

This species belongs to Chapuis's group *Cupulati*, and is very closely allied to *P. biuncus*, Blandf., from which it is separated by being slightly shorter and much broader, with the apical processes in the male not approximating at the tip, the postero-lateral angles being right angles; on the other hand, the frontal sculpture is very similar in both, and possibly the present species may merely be a local variety. As want of material prevented dissection, M. Chapuis's diagnosis of sex has been followed.

#### DIAPUS, Chap.

In the three following new species, whilst they agree with the generic characteristics in other respects, the labial palpi are undoubtedly three-jointed. As M. Chapuis both figures and describes the palpi as two-jointed, it becomes necessary to enlarge the diagnosis so as to include two or three joints, as, similarly, Chapuis describes those of *Crossotarsus* as one- or two-jointed.

#### *Diapus capillatus*, sp. n.

Caput nigrum; prothorax brunneus, elytris flavo-brunneis, antennis pedibusque flavis; fronte valde concava, antica parte pilis densis fasciculatis circumdata; mandibulis appendice margini externo affixa antennis longitudine subæquali; antennarum scapo pilis densis longisque fasciculatis, apice oblecto, clavo solido; palpi labiales triarticulati. Prothorace elongato, posteriore in utroque sulci latere congerie punctorum, squamulis flavis pilisque transverso ornato, elytris punctato-striatis.

Long. 3·2 mm.

*Loc.* Darjeeling, N. India (*C. G. Rogers*).

These specimens appear to have been taken out of a railway-sleeper, made of *Quercus lamellosa*.

Head black, prothorax brown, elytra yellow-brown, antennæ and legs yellow; head concave in front with coarse punctation and two deep impressions on each side of a median line extending longitudinally about halfway to the vertex, which is coarsely punctured; two tufts of yellow hair just above the epistoma turn slightly upwards, four other tufts arising close behind; the front is slightly elongate; the appendages to the mandibles are flat and expanded towards the apex, the inner edges being serrated, there is a large tuft of yellow hair at the apex of the scape, pointing forwards and downwards; the first joint of the funiculus is inserted into the outer side of the scape close to the apex (which is much dilated) and is large and globular, the second joint elongate, and the rest transverse; the club is solid without any sutures, of a pale colour, uniformly covered with short hairs and large pores on the outer surface, which also has a narrow chitinous ridge from the base to about the centre; the prothorax is oblong and deeply indented at the sides, with a slight median line extending from the base to the centre; just above the deeply bisinuous base a narrow row of pale hairs extends from the median line almost to the sides and above this there is a row of large punctures intermixed with pale scales, above which again are scattered a number of large punctures as far as the anterior limit of the median line, the rest of the surface being plain; the elytra are translucent, becoming darker towards the apex, and very faintly punctate-striate—they have a thick transverse basal ridge and are bluntly rounded at the apex; the fifth abdominal segment is concave and edged with a few hairs.

*Diapus furtivus*, sp. n.

♂. Piceo-brunneus, elytris semipellucidis, antennis pedibusque ferrugineis; fronte inæquali; antennæ juxta verticem capitis insertæ; palpi labiales triarticulati; prothorace oblongo, in utroque carina latere congerie foraminorum transversa ornata; elytris subtilissime lineato-punctatis, interstitiis planis, uniseriatim punctatis, margine apicale rotundato.

Long. 3.5–4 mm.

♀. Fuscus; elytris semipellucidis; fronte plano, antice medio carina parva inter duas lacunas ornato; antennæ inter basin mandibularum et emarginationem oculorum insertæ; prothorace ut in mari; elytris subtilissime striato-punctatis, interstitiis planis, apice spinis retusis ornatis; abdominis segmento ultimo concavo.

Long. 4 mm.

*Loc.* Assam.

Head and prothorax almost black; elytra translucent, but darker towards the apex; the front concave and the antennæ inserted in a line almost parallel with the upper edge of the eyes; at the base of each antenna, on the inner side, arises an oval excrescence, larger than the eyes themselves and covered with deep punctures over the whole surface; these raised portions are continued, in a lesser degree, round the lateral margins of the front, and, being of a paler colour than the rest of the surface, give a very distinctive appearance to the insect; a median longitudinal line extends from the epistoma nearly to the vertex, where it ends abruptly in a single large puncture, other punctures occur on either side of this line and of the median carina on the vertex; a small bunch of bright yellow hair is placed at the centre of the epistoma, and smaller ones at the apical frontal angles near the insertion of the mandibles. The prothorax is oblong with a very short basal median line, on each side of which are eleven large pores, somewhat irregularly placed and each provided with a single narrow process (or possibly a stout hair) affixed just inside the posterior edge of the pore and extending almost across to the anterior side; the rest of the surface of the prothorax is shagreened, with a few scattered and shallow punctures; just behind the anterior lateral angles the prothorax is deeply excised for the reception of the femora. The elytra are very feebly lineate-punctate and rounded apically, the interstices flat with indistinct single rows of minute punctures; there is considerable separation of the elytra at the sutural base and the scutellum is large and triangular. The anterior coxæ are widely separated and elongate, the femora very flat and broad, and darkened in colour on the anterior edge, the tibiæ are deeply ridged externally; the first joint of the anterior tarsi is very hairy.

In the female the insertion of the antennæ is normal, the frontal carina is very narrow and has a deep cavity on each side just over the mouth, the rest of the front is coarsely punctured.

The prothorax is similar to that of the male, but the basal pores are fewer in number, generally 3-5 on each side of the median line; the elytra are pale basally, becoming darker on the apical half, and having the interstices more convex than the males, the apex of each elytron is armed with five blunt spines of almost equal length, truncate and furnished with two or three hairs at their extremities; the abdomen transversely convex with the last segment deeply concave, coarsely punctured, and sparsely covered with short yellow hairs and having a median vertical carina on the upper half.

*Diapus mirus*, sp. n.

Fuscus, elytris translucidis, fronte tota longis pilis flavis oblecta; palpi labiales triarticulati; antennæ inter oculos insertæ; prothorace in utroque carinæ latere congerie foraminorum transversa ornato; elytris obsolete lineato-punctatis, interstitiis planis uniseriatim punctatis, margine apicale rotundato.

Long. 3·7 mm.

*Loc.* Assam.

Head black, prothorax dark brown, elytra translucent but darker towards the apex; from the anterior edge of the front arises a transverse ridge of stout yellow hairs divided into four groups which extend upwards and backwards over the whole of the front to the middle of the vertex. Between the eyes are two large clusters of similar hairs, also divided into groups, the inner pair of which extend straight out from the front but are slightly bent downwards at the tips and then end very abruptly, having a total length of over ·5 mm.; the other two groups are twisted outwards round the first pair and then cross the middle of the front, thus concealing nearly the whole frontal surface; the front is nearly smooth and has a central longitudinal line. The labial palpi are similar to those of the last species; the insertion of the antennæ is not quite so near the vertex as in *D. furtivus*; the prothorax has no median line, but there is a group of large pores similar to those of *furtivus*; the elytra show some faint traces of lines of punctures, and are rounded apically.

LV.—*Note on the Voles of the orcadensis Group.*

By MARTIN A. C. HINTON.

IN his recently published 'Catalogue of the Mammals of Western Europe' Mr. Miller\* refers the three Orkney voles hitherto described to two species, namely:—

- (1) *M. orcadensis*, Millais, described from Pomona, and to which the voles of the islands Rousay, Shapinsay, and South Ronaldshay (South Orkneys) are referred also.
- (2) *M. sandayensis*, Millais, inhabiting the North Orkneys. With two subspecies:—

a. *M. sandayensis sandayensis*, Millais, from Sanday.

b. *M. sandayensis westræ*, Miller, from Westray.

\* Miller, Cat. Mamm. Western Europe, 1912, pp. 661-2, 694-700.



Mr. Miller says that "The degrees of distinctness of the Orkney voles among themselves appear to bear a direct relation to the depth of water separating the islands, and therefore presumably to the length of time that the different colonies have been isolated. The numerous specimens of *M. orcadensis* examined from four islands of the southern group show no indication of the existence of local forms" \*.

Since the 'Catalogue' was printed Mr. W. R. Ogilvie-Grant has enriched the National Collection with a fine series of specimens from Sanday and Rousay, including a good many thoroughly adult skulls. I have had to study this material carefully in connection with the Pleistocene *M. corneri*, and it now appears difficult to regard the differences between *orcadensis* and *sandayensis* as of specific value. In this paper, therefore, all the Orkney voles are referred to *M. orcadensis*. This species is apparently a modified relict of the Pleistocene fauna of western Europe such as we should expect to encounter in the Orkneys. As an effect of long segregation on small islands *M. orcadensis* is differentiated into a number of local races or subspecies; with the possible exception of those from Shapinshay (which I have not seen recently), one is able to distinguish the voles of each island from those of all the other islands.

The characters which differentiate the skull and teeth of *M. orcadensis* from those of less modified members of the *arvalis* group seem to be correlated with an increased development of the temporal muscle †; the beginnings of the changes consequent upon such an increase are seen in several arvaloid voles, and they culminate in *orcadensis* ‡. The features which distinguish the skulls and teeth of the various island races of the latter from each other in turn appear to be consequential upon variations in the development of the anterior and posterior portions of the muscle. To appreciate this it is necessary to study the skulls of old and young individuals comparatively; in the table at pp. 458 & 459 those measurements which throw light upon these points have been taken from my full tables and summarized.

In young skulls of *M. o. orcadensis* (Pomona, condylo-basal length 24-25.4 mm.) the temporal ridges are, of course, very feebly indicated and are widely separated in the interorbital and interparietal regions. In many respects the brain-case

\* *Op. cit.* p. 696.

† The large size of the temporal fossæ was pointed out by Prof. Charnock Bradley (*Ann. Scott. Nat. Hist.* 1905, p. 5).

‡ Parallel changes are seen in other groups of voles, *e. g.*, to a lesser degree in *M. agrestis* and to a more marked one in *Stenocranius*.

closely resembles that of the adults of less modified members of the *arvalis* group (e. g., *M. a. levis*); the squamosals are separated anteriorly by a space equal to, or more than, the least width of the interorbital region; the squamous portions of the parietals are small, overlapping the frontals to a very limited extent, so that the coronal suture forms a wide and deep emargination of the parietals, while the posterior border of the frontals is a broad semicircular process; the interparietal is laterally unreduced, and has the short broad form which characterizes it in *M. agrestis* and other comparatively primitive voles.

In passing from youth to age the growth of the temporal muscle moulds the outer surface of the brain-case, and induces several important changes in the form of its component bones. The temporal ridges gradually become more salient and relatively higher in position. With the growth of the anterior portion of the muscle the ridges eventually fuse into a strong sharp crest in the interorbital region, and the latter becomes relatively narrower; the squamosals gradually encroach upon and ascend the sides of the frontal at the hinder end of the interorbital region, until at length their upper edges are separated from each other by little more than 1 mm.; the squamosal crest, whence the strong postorbital tendon of the temporal arises, becomes more and more salient; the squamous portions of the parietals are enlarged and, more extensively overlapping the frontals than in the young, they reduce the width of the notch formed by the coronal suture, the posterior process of the frontals being correspondingly reduced to a narrow projecting tongue (*cf.* the dimensions *a*, *b*, and 3 in table at pp. 458 & 459). With the growth of the posterior portion of the muscle the distance between the ridges behind is diminished and the lateral processes of the supraoccipital become more salient; the supratympanic fossæ from which this portion of the muscle arises on either side are therefore extended, and occupy a relatively wider tract upon the dorso-lateral parts of the brain-case (*cf.* dimensions 8, 9, and 9-8 in part ii. of the table at pp. 458 & 459). The lateral extremities of the interparietal are consequently reduced, and its growth is confined to longitudinal extension; by far its larger portion is situate between the temporal ridges, and this portion acquires in consequence of the lateral reduction a peculiar pentagonal outline in adults which is very different from the form seen in young skulls of *orca-densis* or in adult skulls of less modified species. We have, in conclusion, to note that in *M. o. orcadensis* the upper border of the jugal is a boldly convex crest for the insertion

of the temporal fascia, imparting to the bone its central expansion, and that the anterior lower cheek-tooth  $c_{-1,1}$  has a deep fourth outer fold.

The youngest skulls of *o. sandayensis* examined are slightly older than the majority of the young skulls from Pomona; making due allowance for this, there is little difference between them. The nasals and diastema are already slightly longer, the molars slightly shorter, and the occiput is a little more depressed than in the young of *o. orcadensis*. In the next stage (subadult, condylo-basal length 26.4–27.6 mm.) nasals and molars have acquired their adult proportions, the former a little longer, the latter a little shorter, than in adult *o. orcadensis*; the diastema is now as long as in the latter, and becomes in adults slightly longer; the occiput is now considerably lower, and becomes still more depressed in the adults. With regard to the parts influenced by the anterior portion of the temporal muscle, the interorbital region becomes progressively more constricted with age, and in adults is considerably narrower than in *o. orcadensis*; the anterior portions of the squamosals approximate so closely in adults that only the sharp interorbital crest separates them; each postorbital (squamosal) crest develops a more salient antero-external projection; and the narrowing of the posterior process of the frontals and coronal emargination of the parietals is still more marked than in *o. orcadensis*. It is evident from these features that the anterior portion of the temporal muscle is relatively stronger than in the latter form (*cf.* dimensions *a*, *b*, and 3 of the table). On the other hand, the figures show (dimensions 8, 9, and 9–8) that in the transition from youth to age the posterior part of the temporal muscle develops much less than in *o. orcadensis*; the difference between young and old skulls is here less striking, and the form of the interparietal is considerably less modified. We recall that in the Sanday vole the upper border of the jugal is but slightly convex, that the bone is therefore slender, and that the fourth outer fold of  $c_{-1,1}$  is reduced and often obsolete. The condylo-basal length of adult skulls ranges from 27.5 to 30.1 mm.; they are therefore as large, if not slightly larger than, those of old *o. orcadensis*.

The youngest skull from Rousay is subadult (condylo-basal length 27.1 mm., the temporal ridges still faint and widely separated in the interorbital region). On comparing it with the adults from the same island, a similar general progress is seen to take place with growth to that traced in *o. orcadensis* and *o. sandayensis*. The  $c_{-1,1}$  has always a deep fourth outer fold as in *o. orcadensis*; the jugal is always slender as in *o. sanday-*

*ensis*; the occiput in the subadult skull and in that of a small but old female is as depressed as in *o. sandayensis*, but in the adult males it is as lofty as in *o. orcadensis*. The anterior portion of the temporal muscle is apparently more strongly developed than in *o. orcadensis*, less so than in *o. sandayensis*; and its effect upon the characters of the interorbital region and anterior part of the brain-case is accordingly an intermediate one. In the small female skull the interparietal is as greatly reduced as in *o. orcadensis*, and the supratympanic fossæ are noticeably more extensive because of the greater saliency of the lateral processes of the supraoccipital; in the adult males the interparietal is slightly less modified and the supratympanic fossæ slightly smaller than in *o. orcadensis*. The posterior portion of the temporal muscle is apparently, therefore, more nearly like that of *o. orcadensis* than that of *o. sandayensis*, but has a tendency to weaken. In its external appearance the Rousay vole is quite like *o. orcadensis*.

More material is required before one can be quite certain of the cranial characters of *o. westrie*. The type is a young adult (condylo-basal length 27.2 mm.); its skull and teeth agree quite closely with Miller's figures 138 *a* and *a'* 139, which, however, represent *o. sandayensis*; the depression of the occiput is more marked than in any of the skulls from Sanday seen by me: *c.-t. 1* has the fourth outer fold obsolete, although in other specimens it is well developed; the jugal is slender; the interorbital region is rather wide and the squamosals not more closely approximated anteriorly than in *o. orcadensis*, but in older skulls probably some further progress will be seen in this region. Posteriorly the temporal ridges approach considerably more than in *o. sandayensis* and only slightly less than in the Rousay form; the interparietal is accordingly modified to nearly the same extent as in *o. orcadensis*; the width across the lateral processes of the supraoccipital is relatively very great, and the supratympanic fossæ are therefore far more extensive than in *o. sandayensis*, and, in fact, considerably exceed those of *o. orcadensis*. Like those of the Rousay form, its cranial and dental characters appear to be, on the whole, intermediate between those of *o. orcadensis* and *o. sandayensis*; in addition, as described by Miller, its external appearance is of an intermediate character also.

The vole of South Ronaldshay is represented by three specimens before me; only one skull is fully adult and sufficiently perfect for detailed investigation. In external appearance, the form of *c.-t. 1*, and the conspicuous expansion of the jugal this form agrees with *o. orcadensis*. The interparietal is even more modified than in the latter form; the



lateral processes of the supraoccipital are considerably more salient and the supratympanic fossæ attain their maximum extension in the group; the posterior portion of the temporal muscle therefore appears to be somewhat more strongly developed than in *o. orcadensis*. On the other hand, the squamosals are more widely separated anteriorly than in any other Orcadian form, although the posterior process of the frontals is as much narrowed as in *o. sandayensis*; the post-orbital crest of the squamosal is relatively feebly developed, and the brain-case, as a whole, appears to be longer, narrower, and more lofty than in *o. orcadensis*; the anterior portion of the temporal muscle is therefore apparently weaker than in *o. orcadensis*. The nasals, diastema, and molars agree in relative lengths with those of *o. sandayensis* rather than with *o. orcadensis*.

It would appear from the facts given above that when the posterior portion of the temporal muscle is the predominant one the jugal is heavy and  $\frac{c-t}{c-t-1}$  complex; this is the condition found in the South Ronaldshay vole and *o. orcadensis*. When the anterior portion of the muscle tends to become the predominant one, the jugal becomes light and  $\frac{c-t}{c-t-1}$  tends to be simplified by losing the fourth outer fold; this condition is seen fully developed in *o. sandayensis*. Many facts, which cannot be discussed here, but of which some have already been dealt with long ago by Winge, lead me to believe that in this group predominance of the posterior portion of the temporal muscle is a more primitive condition than is predominance of the anterior portion. The Orcadian voles may therefore be arranged as subspecies of *M. orcadensis* in the following order, beginning with the least modified:—

*M. orcadensis*, Millais.

(1) *M. orcadensis ronaldshaiensis*, subsp. n.

*Hab.* South Ronaldshay.

*Type.* An adult male (B.M. 7. 11. 16. 1).

*Diagnosis.*—External appearance as in *M. o. orcadensis*. (Collector's measurements of type: head and body 126 mm.; tail 41; hind foot 19; ear 11·5.) Skull distinguished from that of *o. orcadensis* by its longer and narrower brain-case; the squamosals slightly more widely separated anteriorly, their postorbital crests less salient, and with no antero-external projection: interparietal slightly more reduced, supratympanic fossæ much more extensive laterally; jugal and  $\frac{c-t}{c-t-1}$  as in *o. orcadensis*. (Cranial measurements: condylo-basal length 29 mm.; zygomatic breadth 17·6; interorbital constriction 3·8; occipital breadth 12·9; occipital depth 7·2; nasals 9·2; diastema 8·7; maxillary cheek-teeth (alveolar) 6·7; mandible 18·6; mandibular cheek-teeth (alveolar) 6·7.)

*Selection of Cranial Measurements of orcadensis Group.*

Position.	<i>M. samius.</i>			<i>M. cornuti.</i> Type, adult.	<i>ronaldshakensis.</i> Type, adult.	<i>orcadensis.</i>			<i>rousiensis.</i>			<i>sandayensis.</i>			<i>vestiva.</i> Type.
	Juv.	Juv.	Type ad.	Type, adult.	Type, adult.	<i>orcadensis.</i>		Subadult.	Adult ♀.	Average of 3 adult ♂.	Juv., average of 2.	<i>sandayensis.</i>			
						Average of 4 juv.	Type, adult.					Subadult, average of 2.	Adult, average of 12.		
L.															
1 .....	23.1	23.4	27.9	28.8	26.6	24.7	28 ca.	27.1	27.7	28.5	25.5	27.0	28.7	27.2	
1 = .....	100	100	100	100	100	100	100	100	100	100	100	100	100	100	
2 .....	58.5	58.9	58.3	57.3	60.8	59.0	61.3	61.0	59.8	60.3	59.8	60.8	60.6	59.4	
3 .....	16.0	15.8	13.4	12.5	13.1	15.9	13.6	14.8	12.6	12.8	14.3	13.5	11.7	13.9	
6 .....	43.8	44.4	39.1	38.6	38.3	44.1	36.2	41.7	37.1	39.0	42.5	41.3	39.4	40.3	
8 .....	26.4	26.9	22.4	22.6	15.5	24.1	16.8	19.9	15.9	17.3	22.6	22.2	19.9	18.0	
9 .....	46.8	47.0	42.4	45.2	44.5	45.5	43.9	46.2	42.9	44.0	44.4	44.1	43.9	47.7	
10 .....	25.1	25.2	22.8	24.3	24.8	25.1	..	23.6	22.3	24.2	23.9	23.1	22.5	23.5	
15 .....	28.6	27.3	28.2	27.4	31.7	28.3	30.7	30.6	31.7	30.9	30.6	31.6	31.9	28.6	

17 .....	27.3	27.3	28.6	31.6	30.0	28.5	29.2	29.5	29.6	30.0	29.0	29.1	30.3	28.6
18 .....	27.3		24.6	21.6	23.1	24.9	23.6	24.0	23.4	23.5	23.7	23.1	23.1	25.3
II.														
6 .....	10.1	10.4	10.8	11.1	11.1	10.9	11.0	11.3	10.3	11.1	10.85	11.15	11.34	11.0
6= .....	100	100	100	100	100	100	100	100	100	100	100	100	100	100
8 .....	60.3	60.6	57.4	58.5	40.5	54.6	42.8	47.8	42.7	44.4	53.1	53.8	50.2	44.6
9 .....	107	106	108.5	117	116	103.5	112	110.5	115.5	113	104.5	107	111	118
9-8 .....	46.7	45.4	51.1	58.5	75.5	48.9	69.2	62.7	72.8	68.6	51.4	53.2	60.8	73.4
a .....	36.6	33.7	29.6	14.4	18.0	31.7	12.7	21.2	8.7	9.3	18.9	19.3	6.4	13.6
b .....	33.7	31.7	24.1	32.4	13.5	22.7	19.1	22.1	12.6	10.8	19.3	18.4	12.7	20.0
c .....	36.6	35.6	34.3	32.4	34.2	35.2	34.6	35.4	34.0	33.0	33.7	32.7	29.5	34.6
23 .....	90.0	88.5	90.8	93.5	..	87.0	88.2	91.1	94.2	90.5	89.0	89.8	88.7	88.3
III.														
9 .....	10.8	11.0	11.7	13.0	12.9	11.27	12.3	12.5	11.9	12.53	11.3	11.9	12.6	13.0
9= .....	100	100	100	100	100	100	100	100	100	100	100	100	100	100
10 .....	53.8	53.7	53.8	53.8	55.8	55.0	..	51.2	52.1	55.0	54.0	52.5	51.3	49.2

1. Condyllo-basal length. 2. Zygomatic breadth. 3. Interorbital constriction. 6. Width of brain-case between ear and zygoma. 8. Least distance between the temporal ridges in the region of the interparietal. 9. Occipital breadth. 10. Occipital depth, median. 15. Nasal length. 17. Diastema. 18. Maxillary cheek-teeth (alveolar). 23. Anterior width of brain-case immediately behind the postorbital squamosal processes. a. Least distance between upper edges of squamosals in the inter-orbital region. b. Width of the posterior or parietal process of the frontals.

In Part I. of table absolute value in millimetres of condyllo-basal length is given and is treated as equalling 100; the reduced values of the other measurements are shown. In Part II. the cranial width in millimetres = 100, and then follow reductions of various other measurements. In Part III. the occipital width = 100, and the reduced value of the occipital depth is given. The positions are numbered as in my full tables.

(2) *M. orcadensis orcadensis*, Millais.*Hab.* Pomona.(3) *M. orcadensis rousaiensis*, subsp. n.*Hab.* Rousay.*Type.* An adult male (B.M. 12. 7. 5. 7).

*Diagnosis.*—External appearance as in *M. o. orcadensis*. (Collector's measurements of type: head and body 135 mm.; tail 36; hind foot 18; ear 12.) Skull with short and broad brain-case, as in *o. orcadensis* and *o. sandayensis*, occasionally depressed; anterior approximation of squamosals and saliency of their postorbital crests intermediate between *o. orcadensis* and *o. sandayensis*; interparietal and supratympanic fossæ essentially as in *o. orcadensis*; jugal always slender, as in *o. sandayensis*;  $\overline{c-t.1}$  always with deep outer fold, as in *o. orcadensis*. (Cranial measurements of type: condylo-basal length 28.9 mm.; zygomatic breadth 17.6; interorbital constriction 3.7; occipital breadth 12.7; occipital depth 7.0; nasals 8.9; diastema 8.9; maxillary cheek-teeth (alveolar) 6.7; mandible 18.8; mandibular cheek-teeth (alveolar) 6.7.)

(4) *M. orcadensis westræ*, Miller.*Hab.* Westray.(5) *M. orcadensis sandayensis*, Millais.*Hab.* Sanday.

*M. sarnius*, Miller, from Guernsey, Channel Islands, is a near relative of *M. orcadensis*. It is distinguished by its external appearance, which recalls the *agrestis* group, and by its longer and narrower brain-case, less spreading zygomata, shorter nasals and diastema, rather longer molars, and smaller bullæ. The nasals are cleft by a small process of the frontals, as in *orcadensis*, but the median septum of the hinder palate is not grooved. Both portions of the temporal muscle appear to be considerably weaker than in *orcadensis*, and consequently the adult skull differs far less from the young. The distance between the temporal ridges behind is relatively greater in adult *sarnius* than in any stage examined in any Orcadian form; the interparietal is therefore scarcely modified, and the supratympanic fossæ are not more extensive than in young *sandayensis*. Anteriorly the squamosals are widely separated, but the posterior process of the frontals tends to become narrow with age. The jugal is light; the fourth outer fold of  $\overline{c-t.1}$  is well developed. The occiput is intermediate in depth between those of *orcadensis* and *sandayensis*.



*M. corneri*, Hinton, is a large vole whose remains occur in the late Pleistocene deposits of England and possibly France (Neschers, Bruniquel, &c.). It is clearly a forerunner of *M. sarnius* and *M. orecadensis*; in fact, the three together may conveniently be separated from the other arvaloid voles as the *orecadensis* group. *M. corneri* is distinguished generally from its two allies by its less expanded zygomatic arches, shorter nasals and molars, longer diastema, and slightly straighter and more protruding incisors. The nasals are narrowly rounded behind and not cleft; the median septum of the palate has a well-marked ventral groove; the molars are of the normal *arvalis* pattern, but very light. The temporal muscle was evidently much weaker, as a whole, than in *orecadensis*. The ridges, though clearly defined in the adult, are not salient. Posteriorly they are relatively wider apart even than in *M. sarnius*, and the interparietal retains to the full the form seen in young *orecadensis* and in the adults of less modified voles; the lateral processes of the supraoccipital are as salient, however, as in *M. o. ronaldshaiensis* or *o. westræ*, and the supratympanic fossæ are therefore considerably more extensive than in *sarnius*, though slightly less so than in *sandayensis*. The jugal has a boldly convex upper border, and its central expansion is therefore marked. The interorbital region is in the degree of its constriction intermediate between those of *orecadensis* and *sandayensis*, and the temporal ridges fuse into a low but sharp interorbital crest; the anterior ends of the squamosals approach each other to nearly the same extent as in *orecadensis*. On the other hand, the posterior frontal process remains broad and semicircular throughout life as in the youngest stages of *orecadensis* (*cf.* dimension *b*); the postorbital crests of the squamosal, though extensive, are but slightly salient and without any antero-external projection. In these weak crests, as well as in the long narrow form of the brain-case, there is some similarity to the skull of *M. o. ronaldshaiensis* as well as to that of *M. sarnius*. The occiput agrees with that of the latter in relative depth.

It is difficult to decide which is the more primitive, *M. sarnius* or *M. corneri*; both are clearly more primitive than *M. orecadensis*, and *M. corneri* occupies a somewhat central position between the two living species. The short nasals, small teeth, narrow zygomata, and, above all, the entirely unmodified interparietal and coronal suture of the fossil lead me to regard it as the most primitive of the three, although it has advanced further than *M. sarnius* in the approximation of the anterior parts of the squamosals.

Mr. Miller, in speaking of *M. corneri*, says :—"The characters by which the fossil is distinguished from *M. sandayensis* are less apparent than those separating the two living Orkney species"; but if the analysis of the characters of the group given above be correct, it is precisely with *M. sandayensis* that our fossil has least to do.

LVI.—*The Fishes of the San Juan River, Colombia.*

By C. TATE REGAN, M.A.

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DR. H. G. F. SPURRELL has recently made an excellent collection of fishes in the Condoto, a tributary of the San Juan, a river of the Pacific slope in S.W. Colombia, and has presented them to the British Museum. Three years ago a series of fishes from the San Juan and its tributaries, collected by Mr. G. Palmer, was acquired by the Museum. These collections are rich in novelties, and, except for a few species recently described by Eigenmann (Indiana Univ. Studies, 1912, no. 8), our knowledge of the fish-fauna of this river-system is based on them.

Characidæ.

1. *Lebiasina multimaculata*, Bouleng.

R. Condoto (*Palmer, Spurrell*).

2. *Piabucina aureoguttata*, Fowler.

R. Lisa and R. Tamana (*Palmer*).

3. *Brycon striatulus*, Kner.

R. San Juan (*Palmer*).

4. *Brycon oligolepis*, sp. n.

Depth of body 3 to  $3\frac{1}{2}$  in the length, length of head  $3\frac{1}{2}$  to  $4\frac{1}{2}$ . Snout nearly as long as or a little longer than diameter of eye, which is 3 to  $4\frac{1}{3}$  in length of head; interorbital width  $2\frac{1}{2}$  to 3. Maxillary extending to below anterior part or middle of eye; lower jaw shorter than upper. 13 or 14 gill-rakers on lower part of anterior arch. 44 to 48 scales in lateral line, 8 or  $8\frac{1}{2}$  from origin of dorsal to lateral line,

$3\frac{1}{2}$  to  $1\frac{1}{2}$  thence to base of pelvics. Dorsal 11-12; origin behind base of pelvics; longest ray about  $\frac{2}{3}$  length of head. Anal 29-32; origin below last rays of dorsal; edge straight or slightly emarginate. Pectoral not or barely reaching pelvics, which sometimes reach anal. Silvery; a black spot at base of caudal; fins dusky, with paler edges.

Nine specimens, up to 220 mm. in total length, from the Rio Condoto (*Spurrell*) and Western Ecuador (*Rosenberg*).

*B. moorei*, Steind., from the Magdalena River, is near this species, but has more numerous scales. *B. atricaudatus*, Kner (*B. scapularis*, Fowler), from W. Ecuador, differs in the same respect and also in the larger head.

#### 5. *Creagrutus leuciscus*, sp. n.

Depth of body 3 to  $3\frac{1}{2}$  in the length, length of head  $3\frac{3}{4}$  to 4. Snout shorter than diameter of eye, which is 3 in length of head and nearly equal to interorbital width. Maxillary extending to below anterior  $\frac{1}{4}$  of eye; lower jaw the shorter. 10 gill-rakers on lower part of anterior arch. Lateral line complete, of 35 or 36 scales; 4 or  $4\frac{1}{2}$  from origin of dorsal fin to lateral line, 3 thence to base of pelvic. Dorsal 10; origin above insertion of pelvics, nearer end of snout than base of caudal. Anal 14-15, emarginate. Pectoral not quite reaching pelvics, which extend to vent or origin of anal. Olivaceous; a bluish-silvery lateral band; no humeral or caudal spots; fins immaculate.

Three specimens, 55 to 80 mm. in total length, from the R. Lisa (*Palmer*) and the R. Condoto (*Spurrell*).

#### XENUROCHARAX, gen. nov.

Near *Deuterodon*, differing in that a scaly flap extends on the caudal fin, covering a pocket opening downwards, ending in a large triangular scale carrying the lateral line nearly to the end of the middle caudal rays, and with its lower half marked with numerous vertical striations.

#### 6. *Xenurocharax spurrellii*, sp. n. -

Depth of body  $3\frac{1}{2}$  in the length, length of head  $4\frac{1}{2}$ . Snout shorter than diameter of eye, which is 3 in length of head and equal to interorbital width. Teeth of outer series of premaxillaries tricuspid, with weak lateral cusps, 2 teeth on one side, 3 on the other; inner premaxillary teeth with 3 strong cusps and sometimes an additional pair of cusps, 4 teeth on each side; anterior mandibulatory teeth similar to

and opposed to inner præmaxillary series, 4 on each side, the fourth considerably smaller than the others and leading to the small lateral teeth; maxillary extending to below anterior  $\frac{1}{4}$  of eye, proximally with 1 or 2 small teeth. Second suborbital completely covering cheek. 38 scales in lateral line,  $5\frac{1}{2}$  from origin of dorsal to lateral line, 5 thence to base of pelvics. Dorsal 10; origin behind base of pelvics, slightly nearer end of snout than base of caudal. Anal 32; origin a little behind middle of dorsal; a scaly sheath at its base; third to fifth and ninth to thirteenth rays armed with series of hooks. Pectoral extending to pelvics, latter to origin of anal. Caudal forked. Olivaceous; a bluish-silvery lateral band; no humeral or caudal spots; fins immaculate.

A single specimen, 57 mm. in total length, from the Condoto (*Spurrell*).

#### 7. *Bryconamericus rubricauda*, sp. n.

Depth of body  $2\frac{1}{2}$  to 3 in length, length of head  $3\frac{1}{2}$  to 4. Snout shorter than diameter of eye, which is  $2\frac{1}{4}$  to  $2\frac{3}{4}$  in length of head, equal to or greater than interorbital width. Maxillary extending to below anterior  $\frac{1}{3}$  of eye. Second suborbital covering cheek, its greatest width from  $\frac{2}{3}$  to as long as eye. Scales 34 to 38 in lateral line, 5 or 6 from origin of dorsal to lateral line, 4 or 5 thence to base of pelvics. Dorsal 10–12; origin behind base of pelvics, equidistant from anterior part of eye and base of caudal; longest ray a little shorter than head; free edge straight or a little convex. Anal 30–33; origin below end of dorsal; a scaly sheath at its base. Pectoral extending to pelvics, which reach origin of anal. Caudal scaly at base only. Olivaceous; a bluish-silvery lateral band ending in a blackish caudal spot; base of anal and proximal part of caudal lobes brilliant orange.

Eight specimens, 35 to 70 mm. in total length, from the Rio Condoto (*Palmer, Spurrell*).

#### 8. *Bryconamericus juanensis*, sp. n.

Depth of body  $2\frac{1}{2}$  to 3 in length, length of head 4 to  $4\frac{1}{3}$ . Snout shorter than diameter of eye, which is  $2\frac{1}{2}$  to  $2\frac{2}{3}$  in length of head, equal to or greater than interorbital width. Maxillary extending to below anterior margin or  $\frac{1}{4}$  of eye. Second suborbital covering cheek, its greatest width  $\frac{1}{2}$  to  $\frac{2}{3}$  diameter of eye. Scales in lateral line 35 to 37, 6 or 7 from origin of dorsal to lateral line, 5 or 6 thence to base of pelvics. Dorsal 11; origin behind base of pelvics, nearly



equidistant from end of snout and base of caudal, longest ray as long as head; free edge straight. Anal 29-32; origin below or just behind end of dorsal; a scaly sheath at its base. Pectoral extending to pelvics, which reach vent. Caudal scaly at base only. Olivaceous; a bluish-silvery lateral band ending in a blackish caudal spot.

Ten specimens, 45 to 90 mm. in total length, from the Rio Condoto (*Spurrell*) and the Rio San Juan and Rio Tamana (*Palmer*).

This species has a larger eye and narrower suborbitals than the preceding and usually more scales in a transverse series. Both have the dentition characteristic of the genus, the premaxillaries with an inner series of 4 teeth on each side and an outer series of 5, the second and fourth internal to the others.

9. *Bryconamericus scleroparius*, Regan.

R. San Juan (*Palmer*).

10. *Hyphessobrycon condotensis*, sp. n.

Depth of body  $2\frac{1}{3}$  to  $2\frac{2}{3}$  in length, length of head  $3\frac{1}{2}$ . Snout much shorter than diameter of eye, which is  $2\frac{1}{4}$  in length of head; interorbital width 3. Maxillary extending to below anterior  $\frac{1}{4}$  of eye; a naked space between second suborbital and preopercle. 33 to 35 scales in a longitudinal series, 10 to 15 in lateral line, 7 or 8 from origin of dorsal to lateral line, 5 or 6 thence to base of pelvics. Dorsal 11; origin nearly equidistant from end of snout and base of caudal; longest ray as long as head. Anal 28-30; origin below posterior part of dorsal; a distinct scaly sheath at base of anterior rays. Olivaceous; a dusky lateral stripe posteriorly; a vertically expanded dark humeral spot, a second dark spot behind it; no caudal spot; dorsal immaculate; base of anal and caudal lobes bright orange.

Several specimens, 30-40 mm. in total length, from the Rio Condoto (*Spurrell*) and the Rio San Juan (*Palmer*).

11. *Astyanax æneus*, Günth.

R. San Juan (*Palmer*).

12. *Nematobrycon palmeri*, Eigenm.

R. Condoto (*Palmer*, *Spurrell*); R. San Juan (*Palmer*).

13. *Gephyrocharax chocoensis*, Eigenm.

14. *Parastremma sadina*, Eigenm.

15. *Ræboides guatemalensis*, Günth.

R. San Juan (*Palmer*).

#### Gastroplecidæ.

16. *Thoracocharax brevis*, Eigenm.

R. San Juan (*Palmer*).

#### Xiphostomatidæ.

17. *Luciocharax striatus*, Bouleng.

R. San Juan (*Palmer*).

#### Anostomidæ.

18. *Curimatus lineopunctatus*, Bouleng.

R. Tamana (*Palmer*).

#### Sternarchidæ.

19. *Sternopygus æquilabiatus*, Humboldt.

R. Condoto (*Spurrell*).

#### Gymnotidæ.

20. *Gymnotus carapo*, Linn.

R. Condoto (*Spurrell*).

#### Pimelodidæ.

21. *Pimelodella eutania*, sp. n.

Depth about  $5\frac{1}{2}$  in the length, length of head 4 to  $4\frac{2}{3}$ . Diameter of eye  $3\frac{2}{3}$  to  $4\frac{1}{4}$  in length of head, nearly equal to interorbital width. Head  $1\frac{1}{3}$  as long as broad; snout a little longer than postorbital part of head; width of mouth  $\frac{1}{2}$  width of head; maxillary barbel extending to middle of anal fin. Dorsal 17; spine nearly smooth,  $\frac{1}{2}$  to  $\frac{2}{3}$  length of head; adipose fin  $3\frac{1}{3}$  to  $3\frac{1}{2}$  in length of fish. Anal 11-12. Pectoral spine  $\frac{2}{3}$  length of head; inner edge weakly denticulated. Pelvics inserted behind dorsal, not reaching anal.

Caudal forked. Greyish; a strong blackish stripe from snout through eye to base of caudal fin; posterior half of each interradiat membrane of dorsal dusky.

Five specimens, 75 to 145 mm. in total length, from the Rio Condoto (*Spurrell*) and the Rio Sipi (*Palmer*).

This species is related to *P. buckleyi*, Bouleng., from the Amazons of Ecuador, which has shorter barbels, a longer adipose fin, a different coloration, &c.

22. *Pimelodella grisea*, Regan.

R. San Juan (*Palmer*).

23. *Rhamdia wagneri*, Günth.

R. San Juan (*Palmer*).

NANNORHAMDIA, gen. nov.

Intermediate between *Rhamdia* and *Nannoglanis*, differing from the former in the absence of dorsal and pectoral spines, the vestigial occipital process, the more posterior position of the dorsal fin, and the shorter anal fin; from the latter in the less depressed head, the eyes lateral and with free margins, the dorsal fin above instead of behind the pelvies, the caudal forked instead of truncate.

24. *Nannorhamdia spurrellii*, sp. n.

Depth of body 6 in the length, length of head  $4\frac{1}{2}$ . Diameter of eye 2 in length of snout, 6 in length of head,  $1\frac{1}{2}$  in interorbital width. Lower jaw the shorter. Maxillary barbel extending to end of pectoral fin. Dorsal 7; origin  $\frac{1}{2}$  as distant from end of snout as from base of caudal; adipose fin as long as its distance from dorsal. Anal 9. Pectoral  $\frac{4}{5}$  length of head, not reaching pelvies, which are inserted below middle of dorsal and do not nearly reach anal. Vent a short distance behind base of pelvies. Greyish; a dusky lateral stripe.

A single specimen, 70 mm. in total length, from the R. Condoto (*Spurrell*).

25. *Pseudopimelodus transmontanus*, sp. n.

Skin with papillae or filaments, which are always evident above the pectorals. Depth of body  $4\frac{1}{2}$  to 6 in the length, length of head 3 to  $3\frac{1}{2}$ . Head nearly as long as broad. Diameter of eye 12 to 18 in length of head, interocular width

2 to  $2\frac{1}{2}$ , length of snout 3 to  $3\frac{3}{4}$ . Jaws equal anteriorly; præ-maxillary band of teeth with a pointed process at each end; maxillary barbel extending to operculum or basal part of pectoral. Occipital process separated by an interspace from basal bone of dorsal spine. Dorsal I 6; spine smooth,  $\frac{1}{4}$  to  $\frac{2}{3}$  length of head. Anal 10. Pectoral spine  $\frac{1}{3}$  to  $\frac{1}{2}$  length of head, serrated on both edges, the posterior teeth usually the stronger, in length not much less than the width of the spine; clavicular process short, its upper edge about equal to diameter of eye. Pelvics not reaching anal. Caudal rounded in adult, in young upper lobe produced and pointed. Adults uniformly dark greyish; young with a pale transverse bar from base of one pectoral fin to the other, a series of 4 pale spots along the back, respectively in front of and behind dorsal fin, on and behind adipose fin, and 3 larger pale spots along each side. Caudal with small dark spots, blackish at base and often crossed by a dark bar posteriorly; other fins either entirely blackish, or with a pale margin, or pale with a blackish bar.

Nine specimens, 60 to 250 mm. in total length, from the Condoto (*Spurrell*), the San Juan and the Tamana (*Palmer*), and the Durango, W. Ecuador (*Rosenberg*).

Related to *P. villosus*, Eigenm., from British Guiana.

### Pygidiidæ.

#### 26. *Pygidium unicolor*, sp. n.

Depth of body 7 in length, length of head 6. Head as broad as long. Diameter of eye 12 in length of head or 3 in interocular width; eyes well in advance of middle of head, close behind nostrils. Barbels as long as head. Dorsal 8-9, with 5 or 6 branched rays, rounded; origin above or a little in advance of vent,  $1\frac{1}{5}$  as far from end of snout as from base of caudal. Anal 7, with 4 branched rays; origin below last rays of dorsal. Pectoral filament  $\frac{4}{5}$  to as long as head, branched rays  $\frac{2}{3}$  length of head. Pelvics covering vent. Caudal subtruncate. Coloration uniform.

Two specimens, 80 and 85 mm. in total length, from the Condoto (*Spurrell*).

#### 27. *Pygidium pilosoma*, sp. n.

Depth of body 7 to 8 in length, length of head 6 to  $6\frac{3}{4}$ . Head longer than broad. Diameter of eye 10 to 12 in length of head,  $2\frac{1}{2}$  to 3 in interocular width; eyes very slightly in advance of middle of length of head, their distance from posterior nostrils  $\frac{1}{6}$  or  $\frac{1}{7}$  of length of head. Maxillary



barbel nearly as long as head, extending to basal part of pectoral. Dorsal 9, with 6 branched rays; free edge straight; origin a little in advance of vent,  $1\frac{2}{3}$  as far from end of snout as from base of caudal. Anal 7, with 4 branched rays; origin a little behind end of dorsal. Pectoral filament as long as head, branched rays  $\frac{2}{3}$  to  $\frac{3}{4}$  length of head. Caudal truncate or slightly emarginate. Yellowish, with dark brown spots on body and fins; young with a dark lateral band.

Three examples, 130 to 250 mm. in total length, from the Rio Sipi and Rio Tamana (Palmer).

28. *Pygidium tania*, Kner.

R. Sipi and R. Tamana (Palmer).

Loricariidæ.

29. *Lasiancistrus caucanus*, Eigenm.

R. Condoto (Spurrell).

30. *Hemiancistrus mayoloi*, Eigenm.

31. *Hemiancistrus holostictus*, sp. n.

Depth of body  $4\frac{1}{3}$  in the length, length of head  $3\frac{1}{3}$ . Head as broad as long, its depth  $1\frac{2}{3}$  in its length, length of snout  $1\frac{2}{3}$ , diameter of eye 7, interorbital width  $2\frac{3}{4}$ . Length of barbel equal to that of mandibular ramus or to diameter of eye. Interopercle freely movable, but with only 2 or 3 very short spines. Occipital plate with median ridge, bordered by a single scute; temporal plates keeled. Scutes keeled, 26 in a longitudinal series; abdomen in great part naked, scaly in front and at the sides. Dorsal I 7; base nearly as long as distance from caudal; first ray longer than head, reaching adipose fin when laid back; last nearly  $\frac{1}{2}$  as long. Anal I 4. Pectoral spine extending to anterior  $\frac{1}{4}$  of pelvis. Caudal emarginate. Caudal peduncle nearly 3 times as long as deep. Head, body, and fins covered with round dark spots.

A single specimen, 180 mm. in total length.

This species is near *H. annectens*, Regan, from Western Ecuador, but differs in the deeper form, the larger dorsal fin, the very small interopercular spines, &c.

32. *Pseudancistrus setosus*, Bouleng.

R. Tamana (Palmer).

33. *Chætostomus palmeri*, Regan.R. Tamana (*Palmer*).34. *Chætostomus lepturus*, Regan.R. Tamana (*Palmer*) ; R. Condoto (*Spurrell*).35. *Chætostomus paucispinis*, Regan.R. San Juan (*Palmer*).36. *Chætostomus marginatus*, Regan.R. Condoto (*Spurrell*).37. *Ancistrus centrolepis*, sp. n.

Depth of body 5 in the length, length of head  $2\frac{1}{2}$ . Breadth of head  $1\frac{1}{6}$  in its length, depth 2, length of snout 2, diameter of eye 7 to 8, interorbital width 2. Length of mandibular ramus  $3\frac{1}{3}$  to  $3\frac{1}{2}$  in interorbital width. Snout with tentacles, its upper surface nearly covered with bony plates, leaving only a narrow naked margin (♀). Interoperculum with 10 or 12 spines; longest nearly  $\frac{2}{3}$  length of head. 24 scutes in a longitudinal series; lateral scutes with the middle 2 or 3 series of spinules enlarged, ending in quite strong spines at the posterior edge of each scute. Dorsal I 7; base as long as its distance from tip of spine of adipose fin; first ray  $\frac{4}{5}$  or  $\frac{5}{6}$  length of head, last reaching adipose fin when laid back. Anal I 4. Pectoral spine reaching anterior  $\frac{1}{3}$  or middle of pelvics. Caudal obliquely truncate. Caudal peduncle  $2\frac{1}{4}$  to  $2\frac{1}{2}$  as long as deep. Uniformly blackish.

Two specimens (♀), 150 and 195 mm. in total length, the larger from Choco, R. San Juan (*Palmer*).

This species is near *A. hoplogenyis*, differing in the structure of the scutes and the narrower naked margin of the snout.

38. *Loricaria magdalenæ*, Steind.R. San Juan (*Palmer*) ; R. Condoto (*Spurrell*).39. *Sturisoma tamanæ*, Regan.R. Tamana (*Palmer*) ; R. Condoto (*Spurrell*).40. *Sturisoma panamensis*, Eigenm.R. San Juan (*Palmer*) ; R. Condoto (*Spurrell*).

41. *Cyclopium cirratum*, Regan.

R. Condoto (Palmer).

42. *Cyclopium ventrale*, Eigenm.

Probably a synonym of *C. cirratum*.

Pæciliidæ.

43. *Rivulus elegans*, Steind.

R. Condoto (Palmer, Spurrell).

44. *Gambusia nigroventralis*, Eigenm.

Perhaps a synonym of *G. episcopi*, Steind.

45. *Gambusia caudovittata*, sp. n.

Depth of body equal to length of head, 4 in length of fish. Diameter of eye 3 in length of head, interorbital width  $2\frac{1}{2}$ . Mouth small; an outer series of strong curved conical teeth especially prominent in upper jaw. Dorsal 8; origin equidistant from posterior part of eye and base of caudal. Anal 9; origin a little in advance of dorsal. Pectoral  $\frac{1}{2}$  length of head. Caudal rounded. 30 scales in a longitudinal series. Olivaceous; a dusky bar across posterior part of caudal.

One specimen, a female, 25 mm. in total length, from the Rio Condoto (Spurrell).

Belonidæ.

46. *Belone fluviatilis*, Regan.

R. Condoto (Spurrell).

Cichlidæ.

47. *Cichlosoma* (*Æquidens*) *cæruleopunctatum*,  
Kner & Steind.

R. Condoto and R. Tamana (Palmer).

48. *Cichlosoma* (*Æquidens*) *biseriatum*, sp. n.

Depth of body  $2\frac{1}{4}$  to  $2\frac{1}{2}$  in the length, length of head  $2\frac{3}{4}$  to 3. Snout as long as or shorter than diameter of eye, which is 3 to  $3\frac{1}{4}$  in length of head and about equal to interorbital width. Jaws equal anteriorly; maxillary extending.

to below anterior margin of eye ; depth of præorbital  $\frac{1}{2}$  to  $\frac{2}{3}$  diameter of eye ; cheek with only 2 series of scales, rarely a third series of 2 to 4 scales running upwards and backwards from behind angle of mouth to below eye ; præopercle scaleless ; 5 or 6 gill-rakers on lower part of anterior arch. 23 to 26 scales in a longitudinal series, 3 from first dorsal spine and 1 or  $1\frac{1}{2}$  from first soft ray to lateral line, 8 rows below lateral line. Dorsal XV 9-10; fifth to twelfth spines subequal,  $\frac{1}{3}$  length of head ; last spine  $\frac{2}{3}$  length of head ; soft fin pointed, extending to anterior part or middle of caudal. Anal III 7-8. Dorsal and anal scaleless. Pectoral nearly as long as head, extending to origin of anal ; pelvics reaching anal. Caudal rounded. Caudal peduncle  $\frac{1}{2}$  to  $\frac{2}{3}$  as long as deep. Uniformly dark or with dark longitudinal stripes or series of spots along the rows of scales ; paler specimens with cross-bars, a lateral blotch, and a small spot at base of caudal ; a blackish spot or ocellus on dorsal fin between tenth and twelfth spines ; often another in front of and another behind it ; dorsal with pale edge and dark intramarginal stripe ; soft dorsal spotted ; lower fins dark-edged.

Seven specimens, the largest 80 mm. in total length, from the Rio Condoto (*Spurrell*).

49. *Cichlosoma (Parapetenia) atromaculatum*, Regan.

R. Condoto (*Palmer, Spurrell*) and R. San Juan (*Palmer*).

50. *Geophagus pellegrini*, Regan.

R. San Juan (*Palmer*) ; R. Condoto (*Spurrell*).

Atherinidæ.

51. *Thyrina guatemalensis*, Günth.

R. Condoto (*Spurrell*).

Gobiidæ.

52. *Philypnus maculatus*, Günth.

R. San Juan (*Palmer*).

53. *Eleotris picta*, Kner & Steind.

R. San Juan (*Palmer*).



54. *Chonophorus transandeanus*, Günth.R. Condoto (*Spurrell*).

## Symbranchidæ.

55. *Symbranchus marmoratus*, Bloch.R. Condoto (*Spurrell*).

## LVII.—On the Shells known as Gemma, Parastarte, and Psephidia. By A. J. JUKES-BROWNE, B.A., F.R.S.

THESE small shells are aberrant members of the Veneridæ, which have sometimes been regarded as independent genera and sometimes as subgenera of *Venus* or *Chione*. A recent examination of specimens under the microscope has disclosed the fact that several mistakes have been made with regard to their internal characters, and has also revealed some features which seem to have escaped notice. I propose, therefore, to give a more complete and accurate account of these shells, and to indicate a species which has been referred to *Psephidia* (= *Psephis*), but which differs in so many particulars that it must be regarded as a distinct subgenus, and, as such, must receive a new name.

## 1. GEMMA, Deshayes.

This little shell was first described as *Venus gemma* by J. S. Totten in 1834\*, and was for a long time supposed to have only two teeth in the right valve, all the text-books copying Deshayes's erroneous statement to that effect, although it is quite clear that Totten and other American conchologists knew quite well that there were three teeth in each valve.

The three teeth of the right valve are fairly well shown in Totten's figure, and he described the dentition as follows:—"Teeth divergent, the medial tooth of each valve stout and triangular, the anterior tooth of the right and the posterior of the left valve thin and not easily recognized." The shell was accepted as a *Venus* by Gould in 1841†, who described

\* 'American Journal of Science,' vol. xxvi. p. 306 (New York, 1834).

† Report on Invert. of Massachusetts, p. 88, fig. 51.

the hinge in Totten's own words, by Hanley in 1843 \*, who does the same, and by Sowerby in 1852 †.

In 1853, however, Deshayes separated it as a new genus under the name of *Gemma*, and printed a Latin description of the generic characters in his 'Catalogue of the Conchifera in the British Museum,' p. 112. At the same time he refers to the 'Proceedings of the Zoological Society' for 1853 as if they contained a previous description of the genus *Gemma*; but no such notice is to be found in that publication. In his description Deshayes distinctly states that there are "dentes cardinales tres in valva sinistra . . . duo in valva dextra, divergentes, fossula lata interposita"; but how he came to make such a mistake is a mystery, for the right valve of *Gemma* shows three widely divergent teeth, the central one being prominent and bifid. In the left valve there are two conspicuous teeth with a wide space between them, but there is also a narrow inconspicuous posterior tooth below the ligament, which is sometimes nearly obsolete, so that it is possible that Deshayes wrote "right" for left valve.

The Messrs. Adams, in 1857, adopted Deshayes's genus, and gave an English translation of his Latin description, thus merely repeating his error ‡. It is again repeated in French by P. Fischer §, although he places *Gemma* as a subgenus of *Venus*.

It was not till 1902 that this mistake was corrected by Dr. Dall ||, who maintains the accuracy of Totten's original description, so far as it goes, and gives a full account of the different names which have been bestowed on the shell and its varieties. Dr. Dall accepts *Gemma* as a genus, and prints a fresh description of the hinge, the cardinal teeth being correctly described; but he asserts that there are also lateral teeth—an anterior lateral in the right valve and a posterior lateral in the left. Curiously enough, however, he describes the opposite margins as "deeply grooved" to receive these "lateral teeth," and does not seem to regard the inner borders of these grooves as lateral teeth, though, according to all precedent, he should do so.

So far as the facts are concerned, *i. e.* the existence of the ridged margins and the corresponding grooves, Dr. Dall is quite correct, but as regards the interpretation of the facts I completely differ from him. If these ridges were lateral

\* 'Catalogue of Recent Bivalve Shells,' p. 126.

† 'Thesaurus Conchyliorum,' Mon. *Venus*, p. 737.

‡ 'The Genera of Recent Mollusca,' vol. ii. p. 419 (issued 1857).

§ 'Manuel de Conchyliologie,' 1887, p. 1083.

|| 'The Journal of Conchology' (Conch. Soc. Gt. Brit.), 1902, p. 238.

teeth the shell would be uniquely abnormal, for, as a rule, when there is only one lateral tooth in each valve these are the left anterior and the right posterior. There is no exception in the *Veneridæ*, and, if there are exceptions in other families, I do not know of them.

I regard these ridges and grooves as merely a modification of the interlocking arrangement which is found on the dorsal margins of many other genera, *when lateral teeth are absent*. Dr. Dall has himself described such grooves in many members of the *Veneridæ*, and he knows very well that the grooves always occur on the anterior margin of the left and the posterior margin of the right valve, the opposite margins being bevelled into long ridges which fit into them. This is exactly how they occur in *Gemma*, the only difference being that the margins are more evenly bevelled into a median ridge, so that they have rather a deceptive similarity to lateral teeth; but this similarity should not have deceived so experienced a conchologist as Dr. Dall.

It appears, however, to have deceived H. C. Lea in 1842, for Dr. Dall refers to his supposition that *Venus gemma* was a *Cyrena*, and remarks, "This indicates that he had correctly identified the teeth, which are like those of *Cyrena*, except that the laterals in *Gemma* are relatively weaker, and the cardinals are not bifid or grooved." This statement is very misleading, for, though there are some species of *Cyrena* in which the laterals are long narrow ridges, they are both in the left valve, and they fit between the *double* laterals of the right valve, so that the dentition is completely different from that of *Gemma*.

I have no hesitation in maintaining that *Gemma* has no lateral teeth, for the following reasons:—(1) The ridges which are supposed to represent them are in opposite valves; (2) the anterior ridge is in the right valve, not in the left; (3) it is not received between two ridges in the opposite valve, but merely into a long groove on the margin; (4) similar ridges and grooves may be seen on the margins of *Gomphina*, *Katelsia*, and other genera.

## 2. PARASTARTE, Conrad.

The shell which is the monotype of this supposed genus was described by Conrad in 1845 as *Astarte triquetra*, but he subsequently separated it as a new genus under the name of *Parastarte*\*. His view of its affinities was accepted by

\* Proc. Acad. Nat. Sci. Philadelphia, vol. xiv. (1862).

Fischer (1887) and by Dall in 1889, but in 1902 the latter transferred it to the Veneridæ, and placed it after *Gemma* in his "Synopsis of the Veneridæ," giving at the same time a full and accurate description of the shell\*.

*Parastarte* resembles *Gemma* in most respects, but differs in two particulars: first, the pallial line is hardly sinuated, but only slightly inflected; secondly, the left valve has only two divergent teeth, separated by a triangular space to receive the strong central tooth of the right valve; these two teeth are clearly anterior and median, so that it is the posterior cardinal which is missing in the left valve, crowded out by the thickness of the two median teeth and the narrowness of the triangular hinge-plate.

We have seen that in *Gemma* this left posterior tooth is reduced to an inconspicuous ridge, and, as a matter of fact, it is often obsolete in the variety *G. purpurea*, so that, as Dr. Dall himself admits, he at one time actually referred this variety of *Gemma* to *Parastarte*. If, therefore, we consider *Parastarte* as a laterally compressed *Gemma*, we can readily understand how this tooth has been eliminated.

I am consequently quite of Dr. Dall's opinion that this shell is closely related to *Gemma*, but I do not consider it entitled to rank as more than a subgenus of *Gemma*. It exhibits similar ridges and grooves on the dorsal margins of its valves, and it is to be noticed that Dr. Dall has never ventured to call them lateral teeth, either in his "Synopsis of the Veneridæ" (1902) or in his 'Monograph on the Tertiary Fossils of Florida' (1903). On the contrary, he describes the dorsal margins of *Parastarte* as "feebly grooved to receive the edges of the opposite valve." Again, in his article on *Gemma*, above mentioned, he writes:—"The nearest relative of *Gemma* is the genus *Parastarte*, Conrad, which differs chiefly by its obsolete pallial sinus and the absence of the left posterior cardinal tooth. Concurrently the lateral grooving of the margins is less distinct." Nothing whatever is said about the corresponding ridges which in *Gemma* he imagined to be lateral teeth! If they are such in *Gemma*, why are they not in its "nearest relative"? The only logical answer is that no lateral teeth exist in either shell.

In view of the facts and considerations above mentioned, and of the close relationship between *Parastarte* and *Gemma*, it seems desirable to describe the genus once more, and in such a manner as to discriminate between the typical form

\* Proc. U.S. Nat. Museum, vol. xxvi. p. 365 (1902).



and the subgenus. It may be added that only one living species of *Gemma* (with two well-marked varieties) and one species of *Parastarte* are known, and both are inhabitants of the Atlantic coast of North America; but two other species of *Gemma* have been recorded from the Tertiary deposits of Florida. The following is an amended description of this little group of shells.

### Genus GEMMA.

Shell small, oval or subtrigonal, smooth or concentrically striated. Lunule large, superficial, circumscribed. Escutcheon not defined. Hinge-plate short; the right valve with three divergent teeth, the median large and triangular, the other two narrow and inconspicuous; the left valve with two or three teeth, the median or its representative being always bifid. Antero-dorsal margin of the left valve and postero-dorsal margin of the right valve grooved to receive the opposite ridged margins. Ventral margins crenulated.

*Gemma*, s. s.—Type, *Venus gemma*, Totten.

Shell short, striate, white or purplish. Three cardinal teeth in each valve. Marginal ridges distinct and the grooves deep. Pallial sinus varying both in shape and size, being sometimes short and angular, sometimes deep, ascending, and rounded.

#### Subgenus PARASTARTE, Conrad.

Type, *Astarte triquetra*, Conr.

Shell taller than broad, strong, equilateral and subtrigonal, smooth, yellowish brown in colour. Hinge with three teeth in the right valve and two in the left. Ligament very short. Marginal ridges and grooves narrow. Pallial line only slightly inflected.

### 3. PSEPHIDIA, Dall.

A little group of shells was named *Psephis* by Carpenter in 1864, and was more clearly defined from the type of *P. lordi*, Baird, in 1865, but was re-named *Psephidia* by Dr. Dall in 1902\* because he found that the name *Psephis* had been used in Lepidoptera by Guenée in 1854. The original *Psephis* of Carpenter included several species, but Dr. Dall found that *P. tantilla* had an anterior lateral tooth and belonged to his *Transnelta*, also that the supposed *P. tellinmyalis* and *P. salmonea* were the nepionic young of other

\* Proc. U.S. Nat. Mus. vol. xxvi. p. 366.

bivalves. In 1902, however, he described a second true species of *Psephis*, which he named *P. ovalis*, and in 1903 he figured a fossil species from the Pliocene deposits of the Pacific coast of America.

According to Dr. Dall, the animal presents some peculiarities, having the mantle-lobes united below, with only an anterior opening for the foot; the siphons are short and simple, and the embryonic young are retained within the mantle-cavity for some time, so that it is pseudo-viviparous.

The shell is small, oval, smooth, with a feebly defined lunule and no escutcheon. In the type (*P. lordi*) there are three cardinal teeth in each valve. The anterior left and the posterior right dorsal margins are narrowly grooved, and the opposite margins are bevelled to form ridges which fit into the grooves; and there is a distinct angular pallial sinus. Dr. Dall, however, is mistaken in saying that the teeth are entire and that the valve-margins are not crenate.

When a valve is examined under a strong lens or an inch objective it is seen that both the median teeth are grooved, as well as the right posterior. It is also seen that the inner margin is faintly striated tangentially, as in the case of *Transenella*, and that it is also minutely crenulated on the anterior and ventral sides. Such a combination of marginal characters is very interesting, and, so far as my experience extends, it is a unique structure.

I have not been able to examine any other species of *Psephidia* to see whether they present the same marginal features, but I should certainly expect to find the tangential striation, even if there was no crenulation.

With regard to the affinities of *Psephidia*, the shell has much resemblance to that of *Gemma*, but the animals differ in several important particulars, although they both have the habit of retaining the embryonic young within the mantle-cavity. On account of this protective habit Dr. Dall would unite them into a distinct subfamily; but I cannot agree with him in regarding it as of more than generic importance.

If the shell of *Psephidia* is compared with that of *Gomphina*, especially of *G. undulosa*, it will be seen that there is a great resemblance between them, the former only differing in the angular form of the pallial sinus and in the margins being curiously sculptured instead of smooth. The two groups of shells can, in fact, be defined in the same generic terms, with distinct subgeneric differences. At present we do not know anything about the animal of *Gomphina*, and it may be found that its mantle-lobes are united below and that

it has the same method of protecting its young. Until it has been proved that the animals are different, it seems to me more convenient to group them together in one genus.

#### 4. *ACOLUS*, J-Br., 1913.

In 1910 Messrs. Cooper and Preston, describing some "New Species of Shells from the Falkland Islands"\*, referred one of them to "*Psephis*" under the name of *P. foveolata*. By the kindness of Mr. J. E. Cooper I have been able to examine good specimens of this species, and find that it differs in several important respects from *Psephidia* (i. e., *Psephis*). The dentition of the left valve is similar, except that the posterior tooth is shorter and more oblique; but in the right valve there are only two teeth, equally divergent from the umbo, and evidently representing the normal posterior and median, so that the anterior is obsolete. There is only a slight inflection of the pallial line, not a real sinus, and the valve-margins are smooth, showing no trace of crenulation or striation except on the dorsal slopes.

These dorsal slopes have peculiar features: the left anterior and the right posterior margins are grooved as usual, but more narrowly than in *Psephidia*; the left posterior margin is raised into a low ridge, which is longitudinally but irregularly striated, and the opposing margin of the right valve is not only grooved, but correspondingly striated inside the groove. These fine striations can only be properly seen under a 1-inch objective.

From the above description it will be seen that the shell referred to *Psephidia* by Messrs. Cooper and Preston differs from the type of that genus in the following particulars:—(1) in the smooth ventral margins; (2) in the peculiar striation of the posterior dorsal margins; (3) in the absence of a left anterior tooth; (4) in the absence of a pallial sinus. These differences are, in fact, greater than those between *Gemma* and *Parastarte*, and are quite too great to allow of the shell being regarded as merely a species of *Psephidia*. It must therefore rank as a subgenus, and as it will require a new name, I now propose that of *Acolus*, from ἀκόλος, a crumb or morsel.

Since, however, I have already proposed to place *Psephidia* as a subgenus of *Gomphina*, and since *Acolus* can equally well be brought under the same generic definition, I will conclude by giving a formal definition of the genus *Gomphina* and the subgenera which may be attached to it.

\* Ann. & Mag. Nat. Hist. ser. 8, vol. v. p. 110 (1910).

## Genus GOMPHINA, Mörch.

Shell trigonal or oval, smooth or concentrically striated. Lunule superficial and circumscribed, but escutcheon not defined. Inner ventral margins smooth or tangentially grooved. Anterior left and posterior right dorsal margins grooved to receive the bevelled and ridged edges of the opposite valve. Hinge-plate short and triangular; teeth divergent, generally three in each valve, the median of both generally grooved. Pallial sinus small. Pedal scar separate from that of adductor.

*Gomphina*, s. s.—Type, *Venus donacina*, Chem.

Shell trigonal, nearly smooth, and nearly equilateral. Three cardinal teeth in each valve, medians feebly grooved; the left posterior confluent with the nymph and sometimes rugose, as also is the right nymph. Pallial sinus short and rounded. Valve-margins smooth.

## Subgenus PSEPHIDIA, Dall, 1902.

Type, *Psephis lordi*, Baird.

Shell small, subtrigonal and subequilateral, smooth. Hinge with three teeth in each valve, both medians grooved, left posterior separated from the nymph. Inner margins tangentially grooved and microscopically crenulated. Pallial sinus short, triangular.

## Subgenus LIOCYMA, Dall, 1887.

Type, *Venus fluctuosa*, Gould.

Shell oval, inequilateral, oblique, concentrically striate. Three teeth in each valve, the medians feebly grooved or entire. Nymphs smooth. Pedal scar not quite separate from adductor. Valve-margins smooth. Pallial sinus short and rounded.

## Subgenus ACOLUS, J-Br., 1913.

Type, *Psephis foveolata*, C. & P.

Shell small, trigonal, equilateral, finely striated. Teeth three in the left valve, the median prominent, triangular, and bifid; two in the right valve, the anterior absent, the median grooved, and the posterior entire. Dorsal margins irregularly striated, but ventral margins smooth. Pedal scar separate from the adductor. Pallial line only slightly flexed.



LVIII.—*Rhynchotragus damarensis variani*, *subsp. n.*  
By R. E. DRAKE-BROCKMAN, M.R.C.S., L.R.C.P., F.Z.S.

I LATELY received from Mr. H. F. Varian, from Lobito, Angola, Portuguese South-West Africa, a dik-dik which differs somewhat from the typical *R. damarensis*, Günther.

The general colour of this dik-dik is brighter and richer than that of the type-specimen, which was obtained nearly three degrees to the south, at Omaruru, in German East Africa. In the present form the pale buffy cinnamon of the flanks extends on to the chest and abdomen, and does not fade to white as in the type. The grizzling of the back is darker, as also are the bases of the long hairs of the back, while the hairs themselves are shorter and more "stubby" than those in the type-specimen.

The bases of the long hairs of the crest are considerably darker than in *R. damarensis*.

There is, unfortunately, no skull to the only other specimen of this race in the British Museum, the immature specimen presented by G. W. Penrice, which was shot on the Coporole River, Angola; so I propose to make Mr. Varian's carefully preserved specimen the type of this northern race, for which I propose the name *R. damarensis variani*.

There is little or no difference in the general coloration of Penrice's immature specimen and Varian's.

The following are the measurements, taken by Mr. H. F. Varian in the flesh:—

	inches.
Height at shoulder .....	15 $\frac{1}{2}$
Girth of chest .....	15
Tip of nose to shoulder .....	12
"    "    root of tail .....	26
"    "    end of tail .....	27 $\frac{1}{2}$
Girth of neck (middle) .....	5
Hind foot .....	7
Ear .....	3
Weight (uncleaned) .....	9 lbs.
Horns:	inches.
Length, right .....	2 $\frac{3}{4}$
"    left .....	2 $\frac{5}{8}$
Circumference at base .....	1 $\frac{1}{2}$
Tip to tip .....	2 $\frac{7}{8}$

*Skull-measurements.*—The following are the comparative

measurements between the skulls of the type-specimen of *R. damarensis* and the present subspecies :—

	<i>R. damarensis</i> , ♀ (skull imperfect).	<i>R. d. variani</i> , ♂.
	mm.	mm.
Total length of skull .....	..	113
Basal length .....	..	99
Condyllo-basal length .....	..	105
Greatest width .....	..	56
Anterior edge of orbit to gnathion..	57	53
Posterior " " " " ..	86	81
Length of nasals " " " " ..	23·5	19
Width " " " " " " ..	10·5	10
Least width between orbits .....	41	38
Upper cheek-teeth .....	38·5	39
Length of palate in middle line ....	55	52·5
Greatest width of palate .....	18·5	18·5
Tip of nasals to gnathion .....	32	32
Anterior part of interparietal suture to gnathion .....	89	84

In the skull of *R. damarensis variani* there is a very well-marked interparietal suture.

Mr. Varian has very kindly presented the above specimen, which includes skin, skull, and entire skeleton, to the British Museum of Natural History.

# LIX.—*Descriptions of Five new Cichlid Fishes from Africa.*

By G. A. BOULENGER, F.R.S.

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## *Tilapia steindachneri.*

Depth of body nearly equal to length of head,  $2\frac{1}{2}$  to 3 times in total length. Head a little more than twice as long as broad; snout with convex upper profile, as long as broad or a little longer than broad, as long as postocular part of head; eye  $3\frac{2}{3}$  (young) to  $4\frac{1}{2}$  times in length of head, equal to interorbital width or to suborbital depth; mouth moderate, about  $\frac{2}{3}$  width of head, extending to between nostril and eye; teeth small, in 3 series, 40 to 60 in outer row of upper jaw; 4 series of scales on the cheek, width of scaly part equal to or a little less than diameter of eye. Gill-rakers short, 12 to 14 on lower part of anterior arch. Dorsal XIV—XV 12–13; spines equal in length from the sixth or seventh,  $\frac{1}{3}$  to not quite  $\frac{1}{2}$  length of head; longest soft rays about  $\frac{1}{2}$  length of

head. Anal III 8-9; third spine as long as and stronger than last dorsal. Pectoral  $\frac{3}{4}$  to  $\frac{4}{5}$  length of head, nearly reaching vertical of origin of anal. Ventral reaching vent or anal. Caudal truncate. Caudal peduncle as long as or slightly longer than deep. Scales cycloid, 31-33  $\frac{3\frac{1}{2}-4}{11}$ ; lateral lines  $\frac{20-22}{12-16}$ . Brownish above, silvery white beneath; soft dorsal and caudal with small red spots.

Total length 125 mm.

Several specimens from Dongwenna Swamp and Que River, Angola, obtained by Dr. W. J. Ansorge in 1907.

Closely allied to *T. ovalis*, Sldr.

### *Tilapia lucullæ.*

Depth of body equal to length of head, 3 times in total length. Head a little more than twice as long as broad; snout with straight upper profile, as long as postocular part of head, longer than eye, which is 4 times in length of head, equals interorbital width, and a little exceeds least depth of præorbital; mouth rather large,  $\frac{3}{4}$  width of head, extending nearly to below anterior border of eye; end of maxillary exposed; teeth in 3 series, outer moderately large, 46 in outer row of upper jaw; 3 or 4 series of scales on the cheek, width of scaly part a little less than diameter of eye. Gill-rakers short, 9 on lower part of anterior arch. Dorsal XVI 9-10; last spine longest, not quite  $\frac{1}{2}$  length of head, longest soft rays  $\frac{1}{2}$  to  $\frac{2}{3}$ . Anal III 8-9; third spine nearly as long as last dorsal. Pectoral  $\frac{3}{4}$  length of head, not extending to vertical of origin of anal. Ventral reaching vent or origin of anal. Caudal rounded. Caudal peduncle  $1\frac{1}{3}$  times as long as deep. Scales finely denticulate, 32-33  $\frac{3\frac{1}{2}}{11}$ ; lateral lines  $\frac{20-22}{12-13}$ . Brownish; dorsal and caudal with round blackish spots, the former with a dark brown longitudinal band in its upper portion; male with the mouth and ventrals blackish (dark blue in life), and a few large bright ocellar spots on the anal.

Total length 115 mm.

Three specimens from the Luculla River, Angola, collected by Dr. W. J. Ansorge in 1910.

Allied to *T. calliptera*, Gthr.

### *Paratilapia corbali.*

Depth of body  $2\frac{1}{4}$  to  $2\frac{1}{3}$  times in total length, length of head  $2\frac{3}{4}$  times. Head twice as long as broad, with steep, nearly straight upper profile; snout rounded, as long as

broad or a little broader than long, shorter than postocular part of head; eye as long as snout,  $3\frac{1}{3}$  times in length of head, equal to interorbital width and exceeding præorbital depth; mouth extending to below anterior border of eye; teeth rather small, in 5 or 6 series, 50 to 56 in outer series of upper jaw; 4 series of scales on the cheek, width of scaly part equal to or a little less than diameter of eye. Gill-rakers short, the largest bifid, 9 on lower part of anterior arch. Dorsal XIV 11-12; spines equal from the eighth, a little less than  $\frac{1}{2}$  length of head, longest soft rays  $\frac{2}{3}$  to  $\frac{3}{4}$  length of head. Anal III 8; third spine  $\frac{1}{3}$  to  $\frac{2}{5}$  length of head. Pectoral as long as or a little longer than head, extending to vertical of origin of anal. Ventral produced into a long filament, extending beyond origin of anal. Caudal truncate. Caudal peduncle much deeper than long. Scales cycloid, 29  $\frac{2\frac{1}{2}-3}{10}$ ; lateral lines  $\frac{18-19}{11-12}$ . Brownish, young with five indistinct darker cross-bars, and a large dark brown blotch below the last rays of the spinous dorsal; a black opercular spot; small light spots on the dorsal and caudal.

Total length 150 mm.

Two specimens from the Corbal River at Chitole, Portuguese Guinea, obtained by Dr. W. J. Ansorge in 1910.

Apparently nearly related to *P. dorsalis*, Pellegr.

*Pelmatochromis multiocellatus.*

Depth of body equal to length of head, which is  $2\frac{1}{5}$  times in total length. Head  $2\frac{1}{4}$  times as long as broad; snout as long as broad, with slightly convex upper profile,  $1\frac{1}{3}$  times as long as eye, which is 4 times in length of head, equals interorbital width, and slightly exceeds præorbital depth; mouth rather large, extending to below anterior border of eye; 2 series of teeth, outer rather large, 50 in upper jaw; 4 series of scales on the cheek, width of scaly part equal to diameter of eye. Gill-rakers very short, 9 on lower part of anterior arch. Dorsal XVI 10; spines increasing in length to the last, which measures  $\frac{2}{5}$  length of head; longest soft ray about  $\frac{2}{3}$  length of head. Anal III 9; third spine stronger but a little shorter than last dorsal. Pectoral  $\frac{2}{3}$  length of head, not reaching vertical of origin of anal. Ventral reaching vent. Caudal rounded. Caudal peduncle a little longer than deep. Scales strongly denticulate, 32  $\frac{3\frac{1}{2}}{11}$ ; lateral lines  $\frac{21}{13}$ . Brown above, whitish beneath; a blackish opercular spot; a blackish bar below anterior third of eye; dorsal and caudal fins with very numerous small ocellar spots forming single series between the rays; anal fin with a few large ocelli.

Total length 120 mm.



A single specimen from the Luculla River, Angola, obtained by Dr. W. J. Ansorge in 1910.

Closely allied to *P. darlingi*, Blgr.

*Pelmatochromis annectens.*

Depth of body  $2\frac{3}{5}$  to  $2\frac{3}{4}$  times in total length, length of head  $2\frac{1}{5}$  times. Head twice as long as broad; snout rounded, with convex upper profile, broader than long, as long as eye, which is  $3\frac{1}{2}$  times in length of head, equals interorbital width, and exceeds præorbital depth; mouth moderate, extending to between nostril and eye; teeth in 3 or 4 series, outer rather large, 50 to 66 in upper jaw; 3 or 4 series of scales on the cheek, width of scaly part less than diameter of eye. Gill-rakers short, 9 or 10 on lower part of anterior arch. Dorsal XV 9-10; spines gradually increasing in length to the last, which measures nearly  $\frac{1}{2}$  length of head; median soft rays produced, as long as head. Anal III 7-8; third spine a little shorter than last dorsal. Pectoral  $\frac{3}{4}$  length of head, not reaching vertical of origin of anal. Ventral reaching origin of anal or beyond. Caudal rounded. Caudal peduncle much deeper than long. Scales cycloid, 28-29  $\frac{23}{10-11}$ ; lateral lines  $\frac{18-19}{9-10}$ . Dark brown, with four blackish vertical bars on the side; blackish spots may be present on the back, alternating with the bars; a black opercular spot; fins dark grey, posterior part of dorsal and anal, and greater part of caudal with numerous small dark and light spots.

Total length 85 mm.

Two specimens from the Lower Niger, presented by Mr. J. Paul Arnold (*cf.* his article in *Wochenschr. Aq.-Terr.* 1913, no. 37, p. 661, fig.).

Connects *P. arnoldi*, Blgr., with *P. ansorgii*, Blgr.

LX.—*Undescribed Species of Cicadidæ.*

By W. L. DISTANT.

THE principal material for the present short paper is a small collection of Cicadidæ made by Mr. Horace Brown at Cue, N.W. Australia, and forwarded to me by my friend Mr. Walter W. Froggatt of the Entomological Branch of the Department of Agriculture, Sydney, N.S.W. The types of these new species are all in the British Museum.

*Pycna nigeriana*, sp. n.

Head, pronotum, and mesonotum ochraceous, lateral and

posterior margins of pronotum paler. Head with two large spots to front, and a spot on each lateral margin of vertex castaneous, area of the ocelli black, with a small curved black spot on each side of same; pronotum with the fissures, a central subbasal spot, extreme basal margin, and the posterior lateral margins black; mesonotum with four obconical spots, the two central ones smallest, a central arrow-shaped spot lunately widened at base, and two transversely waved spots near posterior margin black or piceous, at anterior margin between the central and lateral spots a small ochraceous spot with black margins; abdomen above castaneous; body beneath and legs dull ochraceous, more or less greyishly pilose; tegmina brownish, opaque, the apical area more or less hyaline, a pale spot in radial area, another below it in fourth ulnar area, an irregular pale fascia crossing first, second, and third ulnar areas, pale spots on each side of the transverse veins at apices of ulnar areas, and pale and brown spots at apices of veins to apical areas; wings brownish ochraceous, darkening towards the hyaline outer margin; head (including eyes) only a little more than two-thirds the width of base of mesonotum; pronotal lateral margins angularly amplified, the angular apices only about reaching base of tegminal basal cells; costal membrane of tegmina prominently arched at base and moderately dilated, a little broader than costal area; face broad, moderately tumid, profoundly longitudinally sulcate and laterally strongly transversely striate; rostrum reaching base of abdomen; tibiae and tarsi more or less castaneous, posterior tibiae strongly spinose; opercula in male short, transversely oblique, well separated internally, apical margins truncately rounded, not passing base of abdomen.

Long., excl. tegm., ♂ 25 mm.; exp. tegm. 76 mm.

Hab. N. Nigeria; Zungeru and Kano (Dr. W. B. Johnson, Brit. Mus.).

Allied to *P. neavei*, Dist.

### *Cryptotympana exalbida*.

*Cryptotympana exalbida*, Dist. Mon. Orient. Cicad. p. 92, t. xiii. f. 12, *a, b* (1891); id. Faun. Brit. Ind., Rhynch. iii. p. 86 (1906).

My knowledge of this species was confined to eight female specimens derived from Sikhim and Nilgiri Hills. Mr. E. E. Green has now presented us with a male specimen from Ceylon, which enables the characters of that sex to be described.

♀. Opercula ochraceous, a little longer than broad, centrally moderately overlapping, their apices extending to posterior margin of the second abdominal segment, outer

margins nearly straight, apices narrowed and obtusely rounded, inner margins oblique.

Long., excl. tegm., 38 mm.; exp. tegm. 106 mm.

*Hab.* Ceylon; Oduchuddan (*Green*).

*Abricta noctua*, sp. n.

Body above black, palely pilose; ocelli red; a large spot occupying each lateral area of the pronotum dull dark ochraceous; the margins of two central anterior spots and the whole of two elongate spots—one of which occupies each lateral marginal area—to the mesonotum castaneous; abdomen somewhat longly palely pilose; face black, the transverse ridges more or less castaneous; sternum thickly palely pilose; legs ochraceous, more or less streaked with black; abdomen black, strongly palely pilose on each lateral area, an ochraceous spot on each side of apical segment; tegmina and wings hyaline; tegmina with the venation mostly black, the costal membrane ochraceous, the upper apical cell and the bases of the second, third, and fourth apical cells piceous or black; wings with the venation ochraceous, the margins of the abdominal area brownish ochraceous; head (including eyes) about as broad as base of mesonotum, head with front subprominent, in breadth about equal to length of lateral margins of vertex, vertex longer than front; face convexly prominent, central longitudinal sulcation narrow, transverse striations distinct; rostrum about reaching posterior coxæ; opercula transverse, apically rounded, not meeting internally nor passing base of abdomen; tegmina with transverse vein at base of second apical area oblique.

Long., excl. tegm., ♂ 22 mm.; exp. tegm. 58 mm.

*Hab.* N.W. Australia, Cue (*H. W. Brown*, type in Brit. Mus.).

*Parnkalla magna*, sp. n.

Head black, palely pilose; pronotum and mesonotum dark castaneous, palely pilose; a central longitudinal line and extreme posterior margin to pronotum narrowly pale dull ochraceous, subposterior margin black; mesonotum with two small, somewhat obscure, dark obconical spots at anterior margin; abdomen dark castaneous, palely pilose, posterior segmental margins dull ochraceous; sternum thickly, longly, palely pilose; an ochraceous line between face and eyes; legs dull ochraceous; tegmina and wings hyaline; tegmina with the veins mostly piceous, costal membrane and post-costal area piceous, inwardly ochraceous, a black fascia crossing bases of first, second, third, and fourth apical areas; wings with the veins paler than those of tegmina; vertex with two distinct longitudinal ridges between the ocelli, head

as long as pronotum, including eyes about as wide as base of mesonotum; face prominent, lateral transverse striations distinct, not centrally longitudinally or very obsoletely sulcate; anterior femora strongly spined beneath; tegmina long and slender, more than three times longer than broad; opercula small and transverse, centrally meeting.

Long., excl. tegm., ♂ 14 mm.; exp. tegm. 45 mm.

*Hab.* N.W. Australia; Cue (*H. W. Brown*, type Brit. Mus.).

*Diemeniana richesi*, sp. n.

Body above black, palely pilose; lateral margins of vertex, sulcation between the ocelli, two discal, longitudinal, angulated spots to mesonotum, basal area of cruciform elevation, and posterior segmental margins olivaceous brown; body beneath and legs dull dark ochraceous; face (excluding margins), head between face and eyes, longitudinal streaks to coxæ and femora, apex of rostrum, annulations to tibiæ, basal margins of opercula, base of abdomen, and a central, longitudinal, macular fascia to same black; tegmina pale, shining, bronzy brown with scattered small testaceous mottlings, venation more or less brownish ochraceous, costal membrane dark testaceous, a black spot with testaceous margins in the fourth ulnar area, and a large black spot crossing bases of first, second, and third apical areas; wings hyaline with testaceous and ochraceous mottlings; head (including eyes) a little narrower than base of mesonotum, strongly sulcated between the ocelli; pronotum centrally longitudinally sulcated; tympana entirely exposed; opercula in male transverse, nearly reaching base of first abdominal segment, posterior margins rounded; rostrum reaching the intermediate coxæ; tegmina almost half as broad as long, basal cell about twice as long as broad.

Long., excl. tegm., ♂ 18 mm.; exp. tegm. 41 mm.

*Hab.* Australia, Southern N.S.W., Coommu (*Dr. Riches*, type Brit. Mus.).

The only other at present known species of this genus is from Tasmania.

PARAGUDANGA, gen. nov.

Head (including eyes) about as wide as base of mesonotum, the front broad, depressed, broader than long, almost continuous with lateral margins of vertex, about as long as vertex, pronotum about as long as head, its lateral margins nearly straight but rounded anteriorly, its posterior angles moderately amplified, mesonotum (including cruciform elevation) as long as head and pronotum together; abdo-



men in male longer than space between apex of head and base of cruciform elevation ; tympana entirely exposed ; opercula in male short, transverse, widely separated, not extending beyond basal segment of abdomen ; rostrum reaching the intermediate coxæ ; tegmina semiopaque, three times longer than greatest breadth, costal margin neither arched nor gibbous, basal cell about twice as long as broad, apical areas eight ; wings with six apical areas ; anterior femora not prominently spined beneath.

Allied to *Gudanga*, Dist., but with the head (including eyes) not narrower than base of mesonotum, mesonotum (including cruciform elevation) as long as head and pronotum together, rostrum only reaching intermediate coxæ, tegmina three times longer than broad, &c.

*Paragudanga browni*, sp. n.

Head, pronotum, and mesonotum black ; pronotum with narrow anterior and posterior margins, a narrow central longitudinal line, and two central spots near base olivaceous brown ; mesonotum with the margins of two central obconical spots and the basal cruciform elevation olivaceous brown ; abdomen above testaceous, the base, a central longitudinal fascia, and the lateral margins (narrowly) black ; sternum black, palely pilose ; lateral and apical margins of face, discal suffusions, and coxæ ochraceous ; abdomen beneath ochraceous, a central longitudinal fascia and the lateral margins (narrowly) black ; legs black, streaked with ochraceous ; tegmina pale fuscous brown, the veins and costal membrane ochraceous, the veins margined with dark fuscous brown ; wings sanguineous, nearly apical third and posterior margin pale fuscous brown ; vertex distinctly sulcated between the ocelli ; face broadly, centrally, longitudinally sulcate, the margins of the sulcation sinuous ; opercula broader than long, their apices roundly truncate ; other structural characters as in generic diagnosis.

Long., excl. tegm., ♂ 20 mm. ; exp. tegm. 41 mm.

*Hab.* N.W. Australia, Cue (*H. W. Brown*, type Brit. Mus.).

*Melampsalta cuensis*, sp. n.

Body and legs virescent ; ocelli red ; eyes castaneous ; tegmina and wings hyaline, the venation virescent, extreme bases of both tegmina and wings ochraceous ; vertex longer than front, longitudinally incised between the ocelli ; face moderately globose, central longitudinal sulcation narrow, the transverse striations not strongly pronounced ; rostrum reaching the intermediate coxæ ; tegmina nearly three times

as long as broad, upper vein to lower ulnar area and lower vein to radial area fused for about a space equal to two-thirds the length of basal cell.

Long., excl. tegm., ♀ 18 mm.; exp. tegm. 50 mm.

*Hab.* N.W. Australia, Cue (*H. W. Brown*, type in Brit. Mus.).

*Melampsalta sancta*, sp. n.

Head black, margins and centre of front, a lateral spot to vertex, and a spot between the ocelli ochraceous; pronotum brownish ochraceous, fissures black, a central longitudinal fascia and the posterior margin ochraceous; mesonotum brownish ochraceous, with six black spots, the two central obconical and fused, on each side of these a small triangular spot and a long fasciate spot near each lateral margin, a small round black spot in front of each anterior angle of the cruciform elevation; abdomen above black, the posterior margins of the segments broadly ochraceous; body beneath and legs ochraceous, central area of face and the ridges, cheeks, and a longitudinal line to femora black; vertex longer than front, sulcate between ocelli; face longitudinally sulcate for two-thirds its length, transverse ridges fine but distinct; rostrum reaching the intermediate coxæ; tegmina and wings hyaline, venation ochraceous or black, extreme bases of both ochraceous; tegmina about two and a half times as long as broad, upper vein to lower ulnar area and lower vein to radial area fused for a space about half the length of basal cell.

Long., excl. tegm., ♀ 16 mm.; exp. tegm. 45 mm.

*Hab.* N.W. Australia, Cue (*H. W. Brown*, type in Brit. Mus.).

*Kobonga froggatti*, sp. n.

Head black, ocelli red, base of front with three small ochraceous spots, vertex with a small ochraceous spot between the ocelli; pronotum castaneous, the anterior margin (narrowly), the posterior margin (broadly), and a central narrow longitudinal fascia bright ochraceous, the lateral margins, subanterior and subposterior margins, and margins of the central pale fascia black; mesonotum castaneous, four obconical spots (the two central shortest and the lateral spots very long), and the area of the basal cruciform elevation black; metasternal margins ochraceous; abdomen above black, posterior segmental margins ochraceous; body beneath black, broad lateral margins to face, coxæ and trochanters (more or less), femora beneath, two longitudinal fasciæ, and margins of anal appendage ochraceous; tegmina and wings hyaline, tegmina with the venation and costal membrane

castaneous, postcostal margin, apical and inner margins narrowly fuscous, bases of first, second, and third apical areas infuscated; wings with narrow fuscous margins as in tegmina, the venation pale castaneous; ulnar areas to tegmina about half as long again as apical areas; rostrum reaching the intermediate coxæ; face broad, narrowly centrally sulcated, the transverse ridges acute; anterior femora strongly spined beneath.

Long., excl. tegm., ♀ 31 mm.; exp. tegm. 86 mm.

*Hab.* N.W. Australia, Cue (*H. W. Brown*, type in Brit. Mus.).

LXI.—*Four new Species of Apidæ (Hymenoptera), with Notes on other Species.* By GEOFFREY MEADE-WALDO, M.A.

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IN the following paper four new species of Apidæ (subfam. Megachilinae) are described. The most interesting addition is *Thaumatostoma turneri*, which brings the number of species in this curious genus up to three, all described from the male sex. Three species of *Megachile* are also described from Tropical Africa. A number of notes on various species and points in synonymy which have arisen at various times are published now for the first time.

All types are in the British Museum, except where stated to the contrary.

THAUMATOSOMA, F. Sm.

*Thaumatostoma turneri*, sp. n.

♂. Niger, punctatus; antennis infra mandibulisque flavis; capite, thorace pedibusque plerumque albido-pilosis, abdominis segmentis 1-3 fasciis apicalibus interruptis albidis; abdominis segmentis 4-6 plerumque ferrugineis, segmento sexto apice dentibus parvis instructo; alis hyalinis.

Long. 7 mm.

♂. Black; antennæ beneath (except the spatulate thirteenth joint) and mandibles yellowish; anterior legs on the inner side, tergites 4 and 5 apically, both tergite and sternite 6 wholly red ferruginous. Face and clypeus covered with a long and dense, postorbital with a sparser, whitish pile; anterior margin of prothorax with two small spots of pale pubescence; pleura and surface of truncation of median segment somewhat densely clothed with pale pubescence. Abdomen

with interrupted apical fasciæ on tergites 1-3, and a complete fascia on a transverse ridge shortly before the apex of sternite 2; legs for the most part clothed with whitish pubescence, that on the anterior tarsi golden. Head and thorax finely and evenly punctured, the abdomen (especially the apical segments) more coarsely. Head massive, somewhat broader than thorax; antennæ (viewed from above) tapering towards the thirteenth joint, which is spatulate; joints 2 and 3 very short, about equal to joint 4; the remaining flagellar joints subequal. Abdominal segment 6 with an apical fringe of small tubercular processes.

Length 7 mm.

QUEENSLAND: Kuranda (type ♂), Mackay, on eucalyptus, Nov. 1899 (*G. and R. E. Turner*); Port Darwin and Baudin Is. (*J. J. Walker*).

4 ♂♂.

The specimen from Mackay varies slightly from the type in having the apical fasciæ complete and the whole of tergite 5 clothed with a short fulvous pubescence. It is possible that the ferruginous colouring on the apical tergites is only visible in specimens from which the pubescence has been rubbed off.

The specimens collected by Commander Walker during the cruise of the 'Penguin' are recorded as *T. duboulayi*, Sm., by Cockerell (*Ann. & Mag. Nat. Hist.* (7) xvi. p. 221, 1905), but he has since suggested that they are distinct from that species.

The three known species of this genus, all described from males, may be separated as follows:—

- |    |  |    |   |
|----|--|----|---|
| 1. | { Antennæ stouter basally, slender apically (with exception of spatulate terminal joint).....  | 2. |   |
|    | { Antennæ slender, linear (except spatulate thirteenth joint), tergite 4 clothed with ferruginous pubescence. L. 11 mm. ....   |    | [Australia.]<br><i>duboulayi</i> , Smith. (West |
| 2. | { Basal flagellar joints strongly contrasted to apical joints, the four subapical joints quite filiform; abdominal sternite 1 armed with two massive blunt tubercles; seventh abdominal segment medially strongly carinate, carina produced to form a short spine, sides of segment produced to form blunt teeth on each side; finely punctured. L. 9 mm. .... |    | [(Rangoon.)<br><i>burmanicum</i> , Bingham.     |
|    | { Antennæ gradually narrowing towards apex; abdominal sternite 1 simple; somewhat coarsely punctured. L. 7 mm. ....  |    | [land.]<br><i>turneri</i> , sp. n. (Queens-     |



## MEGACHILE, Latr.

*Megachile silverlocki*, sp. n.

♀. Nigra; area postoculari, pleuris sternoque sparsim, segmento mediano, tergitebus 1-3 lateribus, albido-pilosis; tergitebus 3-5 fasciis apicalibus, 6 omnino ferrugineo-hirtis; scopa ferruginea, apice pallidiori, metatarsis iii. ferrugineis intus aurantiaco-hirsutis; clypeo medio longitudinaliter carinato; alis fuscis.

Long. 13 mm.

Black; the area behind the eyes, pleura and sternum sparsely, median segment, and tergites 1-3 postero-laterally clothed with white pubescence; tergites 3-5 with apical fasciæ of ferruginous pubescence, tergite 6 entirely clothed with ferruginous pubescence. Tarsi on the outside covered with a pale fulvous pile; metatarsus iii. ferruginous, on the inside clothed with golden pubescence. Scopa ferruginous, paler basally. Wings dark fuscous. Whole insect covered with fine even punctures, with the exception of the mandibles and clypeus, where it is coarser.

Clypeus convex, truncate, with a conspicuous, median, longitudinal keel.

6 ♀ ♀, 6 ♂ ♂.

Length 13 mm.

♂. Similar to ♀ in general facies, but smaller. Clypeus densely covered with white pubescence; abdomen apically bidentate; anterior coxæ and tarsi simple.

*Hab.* NORTH RHODESIA: 70 miles W. of Kariba Gorge, vi. 1910 (♀ type); Algoa and Mburumu, v. 1910, 2 ♀ ♀ (*O. C. Silverlock*); Upper Luangwa River and Niamadzi River, vii. and viii. 1910 (*S. A. Neave*). BELGIAN CONGO: Sankisia, ix. 1911, ♂ ♀; Bukama, iv. 1911, 2 ♀ ♀ (*Dr. J. Bequaert*).

Co-types in Musée du Congo Belge.

*Megachile mlanjensis*, sp. n.

♀. Nigra, facie prothoraceque nigro-, sterno, pleuris, segmento mediano, segmento abdominali primo pedibusque plerumque albido-hirsutis; tergitebus 2-6 ferrugineo-pubescentibus; scopa ferruginea; tarsis intermediis metatarsisque iii. intus ferrugineo-hirtis; capite gibboso, thorace latiori; clypeo brevi, plano; alis fuscis, venis ferrugineis.

Long. 20 mm.

♀. Black; the face and prothorax with black pubescence; pleura, sternum, median segment, tergite 1, and legs for the most part clothed with white pubescence; tergites 2-6

entirely clothed with ferruginous pilosity. Scopa ferruginous. Intermediate tarsi altogether and metatarsus iii. on the inside clothed with ferruginous hair. Head subnitidulous, massive, wider than the thorax; clypeus flat, twice as broad as long; mandibles thick, 4-toothed. The whole insect uniformly covered with fine punctures, but only the head nitidulous; the thorax glabrous.

1 ♀.

Length 20 mm.

*Hab.* NYASALAND: Mlanje, 4. xii. 1912 (*S. A. Neave*).

The following species have a strong superficial resemblance to one another, owing to the general similarity in the coloration of their pubescence. They may be separated as follows:—

Black; metathorax with whitish and abdomen with a varying amount of whitish and reddish pubescence; wings fuscous.

- |   |   |
|---|---|
| 1. (2) Head very massive. Length 20 mm. Clypeus considerably broader than long; mandibles massive, 4-toothed; segments 2-6 clothed with reddish pubescence; scopa reddish ..... | <i>M. mlanjensis</i> , sp. n.                                     |
| 2. (1) Head normal. Length 13-17 mm.  |   |
| 3. (4) Clypeus with a longitudinal carina. Length 13 mm. ....   | <i>M. silverlocki</i> , sp. n.                                    |
| 4. (3) Clypeus without a carina. Length 15-17 mm. ....  | <i>M. nigrifacies</i> , Vach.<br>(= ? <i>cradockensis</i> , Fr.). |

*M. chrysorrhæa*, Gerst., and *M. luangwæ*, M.-Waldo (subgenus *Eumegachile*), belong to this group as regards colour-pattern.

*Megachile (Eumegachile) sankisiæ*, sp. n.

♀. Nigra, cylindrica, nitida, vix punctata, griseo-hirta; mandibulis intus aureo-, clypei lateribus, area postoculari, pleuris, metanoto, abdominis fasciis apicalibus, præcipue lateribus, scopaque griseo-pubescentibus; tarsi intus pallide flavis; alis subfuscis, basi hyalinis; mandibulis forcipatis, apice latioribus, vix dentatis; terg. 2<sup>do</sup> et 3<sup>tio</sup> sulcis transversis mediis instructis; labro rugoso, sulco longitudinali, lato, subnitido.

Long. 15 mm.

♂. Similis ♀, sed tarsi anterioribus dilatatis coxisque anterioribus inermibus; antennarum articulo ultimo spatulato, acuto.

Black, shining, especially the mesonotum and abdomen; mandibles within fringed with bright golden-brown hairs;

base of mandibles, the clypeus at sides, the area behind the eyes, mesopleura sparsely, and lateral angles of median segment profusely, clothed with griseous pubescence, more profuse at the sides; ventral scopa griseous. Pubescence on the inner side of all the tarsi faintly fulvous.

Wings fusco-violaceous, hyaline at apex.

Postscutellum dull, impunctate, the whole otherwise weakly punctured; clypeus extremely short, truncate, with a broad blunt tubercle medially, the surface of the truncation shining; mandibles arched, broadest at apex, which is faintly 4-toothed; labrum rugose, a broad longitudinal median furrow, shining, almost impunctate.

Length 15 mm.

♂. Similar to ♀; anterior tarsi dilated, pale testaceous; anterior coxæ simple; terminal joint of antennæ spatulate, acute.

*Hab.* BELGIAN CONGO: Sankisia, viii., ix., 1911 (*Dr. Bequaert*), 4 ♀ ♀, 4 ♂ ♂, type in Congo Museum, co-types in British Museum; Lualaba River, 2500–4000 ft. (*S. A. Neave*), 1 ♂.

#### NOMIOIDES, Schenck.

*Nomioides pulchella*, Schenck, Jahrb. Ver. Naturk. Nassau, xxi., xxii. p. 312 (1867–8) (1870). ♂ ♀.

*Ceratina cerea*, Nurse, Journ. Asiat. Soc. Bengal, lxx. p. 152 (1902). ♂.

#### *Nomioides curvilineata*.

*Ceratina curvilineata*, Cam. Bombay Journ. Nat. Hist. Soc. xvii. p. 1003 (1907).

#### ALLODAPE, Lep.

The three species described as *Prosopis* by Colonel Bingham are all referable to the above genus, two of the species having been previously described by Frederick Smith. All three species were in the Distant Collection, now the property of the British Museum. Their synonymy stands as follows:—

*Allodape variegata*, Sm. Catal. Hymen. Brit. Mus. ii. p. 229. no. 5 (1854).

*Prosopis sandarucata*, Bingham. Ann. & Mag. Nat. Hist. (7) xii. p. 49 (1903).

The types of both these species are from Natal.

*Allodape cordata*, Sm. Deser. New Spec. Hymen. p. 98. no. 2 (1879).

*Prosopis pernix*, Bingham. Ann. & Mag. Nat. Hist. (7) xii. p. 49 (1903).

Type of *A. cordata* from Cape of Good Hope, *A. pernix* from Natal.

*Allodape gracilis.*

*Prosopis gracilis*, Bingham, Ann. & Mag. Nat. Hist. (7) xii. p. 50 (1903).

*Allodape panurgoides*, Sm. Catal. Hymen. Brit. Mus. ii. p. 231. no. 10 (1854).

*Allodape ceratinoides*, Grib. Bull. Soc. Entom. Ital. xvi. p. 269 (1884).

Specimens of *A. ceratinoides* from Algoa Bay, Cape Colony, determined by Dr. Brauns, agree perfectly with Smith's type from "South Africa."

*Allodape pictifrons*, Sm. Catal. Hymen. Brit. Mus. ii. p. 228. no. 2 (1854).

*Allodape strigata*, Brauns, ? in MS.

The South African specimens (co-types of Dr. Brauns) differ in no way from *A. pictifrons* from Sierra Leone.

## CERATINA, Latr.

Bingham (Fauna Brit. Ind., Hymen. vol. i.) and Cockerell (Trans. Amer. Ent. Soc. xxxi. p. 325, 1905) have dealt respectively with Indian and American species of this genus. The following two species from Ega (*H. W. Bates*) may be noticed:—

*Ceratina bicolorata*, Sm.

Head, thorax, and abdominal segments 1-3 obscure bronze, with purple tint, abdominal segments 4-6 greenish; clypeus with a deep longitudinal impressed line.

*Ceratina longiceps*, Sm.

Uniformly bronze-green; clypeus produced, giving the head a long appearance, as in some species of *Halictus* (*Thrinchostoma*).

*Ceratina subquadrata*, Sm. Catal. Hymen. Brit. Mus. p. 224. no. 7 (1854).

*Ceratina sulcata*, Friese, Wien. ent. Zeit. Bd. xxiv. p. 13 (1905).

Smith's species from "S. Africa" has priority over *C. sulcata*, Fr., of which there is a co-type in the British Museum.

## DIOXYS, Lep.

*Aglaopis brevipennis*, Cam. Entomologist, xxxiv. p. 263 (1901).

This insect, described as the type of a new genus, from



Bombay, is a typical *Dioeys*, very much resembling *D. cineta*, Jur.

Through the kindness of Dr. G. Severin and Dr. H. Schouteden I have been able to examine a number of the Vachal types contained in the Museum d'Histoire naturelle, Brussels, and the Congo Museum, Tervueren.

The following species require notice:—

*Type in Congo Museum.*

*Megachile brachiata*, Vach. (1909)=MEGACHILE (AMEGACHILE) FIMBRIATA, Sm. (1853).

*Types in Brussels Museum.*

*Megachile excesa*, Vach. (1903)=MEGACHILE (AMEGACHILE) BITUBERCULATA, Rits. (1880).

MEGACHILE MELES, Vach. (1903)=*Megachile armatipes*, Fr. (1909).

*Megachile stuppea*, Vach. (1903)=MEGACHILE CINCTA, F. (1781) (type in B.M.).

*Megachile ancillula*, Vach. (1903)=MEGACHILE VENUSTA, Sm., ♀ (1854) (type in B.M.).

*Megachile strictipalmis*, Vach. (1903)=MEGACHILE VENUSTA, Sm., ♂.

Type-specimens of *Megachile bouyssoni* and *M. deversa*, in both cases males, were also examined. Both come from the same locality (Chutes de Samlia) and appear to be identical. Possibly the females have good characters for separation.

*Trigona cearina*, Vach. (1903)=TRIGONA CAMEROONENSIS, Fr. (1900).

TRIGONA DENOITI, Vach. (1903)=*Trigona clypeata*, Fr. (1909).

*Melipona punctata*, D. T.

TRIGONA PUNCTATA, Sm. (1854)=*Trigona mellarius*, Sm. (1862)=*Trigona perilampoides*, Cress. (1878).

Smith's type of *T. mellarius* is in very poor condition, but it is certainly co-specific with his *T. punctata*, described at an earlier date. There is a specimen of *T. perilampoides* in the British Museum from Cresson's own collection, presented to Frederick Smith. The coarse thoracic puncturing of this species is very characteristic.

*Megachile luangwæ*, nom. nov.

*Megachile (Eumegachile) newei*, M.-Waldo, Ann. & Mag. Nat. Hist. (8) x. p. 473 (1912).

A species of Vachal's (Ann. Soc. ent. Belge, p. 309, 1910) had already received this specific name.

LXII.—*Diptera from the Falkland Islands, with Descriptions of a new Genus and Two new Species.* By ERNEST E. AUSTEN.

(Published by permission of the Trustees of the British Museum.)

THE Diptera described or mentioned below, with the exception of two or three specimens from other sources, form part of a small series of Falkland Islands insects collected and recently presented to the British Museum (Natural History) by Mr. Rupert Vallentin. Although no more than four species of Diptera are represented in the collection, at least two appear to have been hitherto undescribed; and of these one, which also belongs to a new genus, is of special interest as forming an addition to the number of species of Diptera with reduced wings already known to occur in antarctic or subantarctic islands.

Dolichopodidæ.

Genus HYDROPHORUS, Wahlb.

*Hydrophorus* sp. incert.

One ♀, north-west corner of West Falkland, "found on ponds" (indeterminable owing to condition).

Syrphidæ.

SYRPHINÆ.

Genus MELANOSTOMA, Schin.

*Melanostoma bertrandi*, sp. n. (Fig. 1.)

♂ ♀.—Length, ♂ (4 specimens) 6.6 to 8.6 mm., ♀ (2 specimens) 6 to 7 mm.; width of head, ♂ 2.25 to 2.6 mm., ♀ just over 2 to 2.4 mm.; width of front of ♀ at vertex 0.8 mm.; length of wing, ♂ 5.75 to 7.5 mm., ♀ 5.4 to 6.25 mm.

*Allied to and in appearance resembling M. stegnum, Say, of North and South America, but distinguishable owing to lower margin of face in present species being more prominent in front and to dorsum of second abdominal segment in ♂ being*

without a triangular metallic spot on each side.—Dorsum of thorax metallic bronze-black, scutellum sometimes more bluish; dorsum of abdomen (except terminal segment and ♂ hypopygium, which are metallic) dull black, entirely devoid of yellow or ochraceous\* markings, but in ♂ with two pairs, in ♀ with three pairs of greyish, greyish-metallic, or plumbeous lateral spots.

Fig. 1.



Profile of head of ♂ (enlarged).

**Head:** profile of face and shape of antennæ as shown in fig. 1; head metallic bronze, with a greenish or bluish tinge on front; face (except tubercle and portion of margin of buccal cavity immediately below it, which are black) and occipital region greyish pollinose, the greyish pollinose area on face far less coarsely and conspicuously punctate than is the case in *M. stegnum*, Say; frontal and vertical triangles in ♂ clothed with black or dark brown hair, sides of face clothed with brownish hair in ♂ and with whitish hair in ♀, jowls and basioccipital region in both sexes clothed with whitish hair, front in ♀ clothed partly with brownish partly with yellowish hair, posterior orbits clothed with pale hair which becomes more yellowish above, upper portion of posterior orbits in ♂ also with some dark brown hairs; first and second joints of antennæ clove-brown, third joint dark sepia-coloured, more or less orange-rufous or ferruginous on inner side at base below. Thorax clothed with pale yellowish or whitish hair, dorsal surface of scutellum in ♂ clothed with dark brown or brownish hair, dorsum of main portion of

\* For names and illustrations of colours, see Ridgway, 'A Nomenclature of Colors for Naturalists' (Boston: Little, Brown, and Company, 1886).

thorax in ♂ also sometimes largely clothed with brownish hair. *Abdomen*: dorsal scutes of third and fourth segments with a more or less rectangular, transversely elongate spot, as described in diagnosis above, in each basal angle, the inner extremities of one or both pairs of these spots usually narrower; dorsal scute of second segment in ♀, but not in ♂, with a similar, bluntly triangular spot on each side, extending to basal angle but not reaching to hind margin; lateral margins of dorsal scute of second segment in ♂ more or less metallic; basal angles and sides of first segment in both sexes more or less metallic; hair on abdomen whitish or yellowish white in both sexes. *Wings* hyaline or nearly so (not noticeably infuscated). *Halteres* mummy-brown or sepia coloured, stalks somewhat paler. *Legs* clove-brown, front and middle tibiæ and distal two-thirds of front and middle femora cinnamon-coloured, hind femora, hind tibiæ, and first joint of middle tarsi also sometimes more or less cinnamon-coloured.

Types of ♂ and ♀, from East Falkland, and two additional ♂ ♂ and one ♀, from West Falkland (*R. Vallentin*); one ♀, from the "Falkland Is.," 1860 (*T. Havers*); and one ♂, from East Falkland, between November, 1908, and February, 1909 (*Lieut.-Col. A. M. Reid, D.S.O.*).

*Melanostoma bertrandi* also occurs in Patagonia, as shown by two ♂ ♂ in the National Collection from Valle del Lago Blanco, Chubut (*J. Koslowsky*).

According to Mr. Vallentin, this species, which is seen on the wing only in bright sunshine, is known to settlers in the Falkland Is. as "the bee." The species has been named in honour of Mrs. Rupert Vallentin (*née Bertrand*), a native of West Falkland, who first directed her husband's attention to the fact that this fly fertilizes the flowers of various species of *Senecio*.

## Tachinidæ.

### CALLIPHORINÆ.

#### Genus CALLIPHORA, Rob.-Desv.

#### *Calliphora erythrocephala*, Mg.

One ♀, West Falkland.

With regard to the occurrence of this species (the common European Bluebottle or Blow-Fly) in the Falkland Islands,



Mr. Vallentin contributes the following note:—"The majority of the settlers are of opinion that this pest was not present on the Islands until the advent of the S.S. 'Salem-bria,' which carried frozen mutton to foreign ports. Others state that this fly was introduced with game sent from time to time from Monte Video. All the old settlers are agreed that this Bluebottle was not found on the Islands when the sheep runs were first started about 1867."

### Dryomyzidæ.

#### PEZOMYIA\*, gen. nov.

*Allied to Actora, Mg., and Paractora†, Bigot, but distinguished from both inter alia by the wings being relatively minute (see fig. 2), and of dimensions so reduced that the appendages in question are useless for flight.*

*Head* (for profile see fig. 2, A): *face* slightly excavated below each antenna, thus showing two shallow depressions separated by a somewhat more elevated median strip; *epistoma* slightly protruding, but lower margin of median portion of face not otherwise prominent; *jowls* descending considerably behind, *jowls* and *palpi*, especially in ♂, clothed with long hair; *vibrissæ* wanting; size of bristles on vertex and front as in *Actora*; *eyes* similar in shape to those of *Actora*, but somewhat smaller; *antennæ* similar to those of *Actora*, arista bare, small, and slender, its terminal segment only slightly thickened at extreme base. *Thorax*: dorsum flattened above, outline of scutellum as seen from above nearly semicircular.

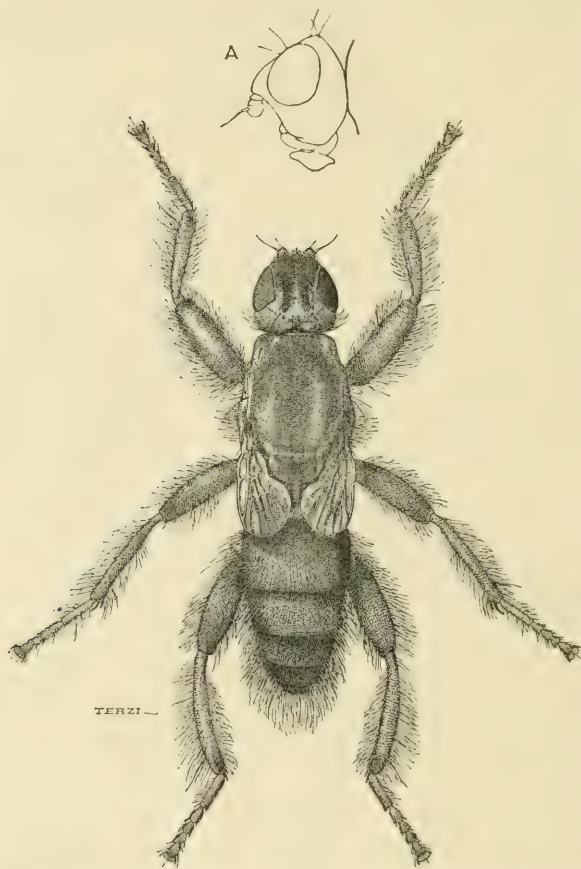
*Thoracic chaetotaxy*:—*Humeral*, 1 (very small, short, and inconspicuous in ♂, long and fine in ♀). *Notopleural*, 2 (anterior one very small and inconspicuous in ♂). *Præ-sutural*, absent in ♂, 1 or absent in ♀. *Supra-alar*, 1 (in ♂ usually absent or so small as to be indistinguishable). *Post-alar*, 2 (often much shorter in ♂ than in ♀). *Dorso-central*, 3 (in ♂ much smaller than in ♀, and, except hindmost, usually difficult to distinguish). *Præscutellar* (inner dorso-central), 1 (very small in ♂). *Scutellar*, 2 (apical usually much the longer). *Sternopleural*, 2 (usually absent in ♂, very slender in ♀, as also in ♂ when present).

\* πεζός, on foot, walking; μυία, a fly.

† 'Mission Scientifique du Cap Horn,' t. vi., Zoologie, Insectes, Dv. 38 (1888).—Founded for *Paractora fuegiana*, Bigot (*ibid.* Dv. 39), from Tierra del Fuego.

*Abdomen* somewhat cylindrical (from third segment onwards) in ♂, flattened dorso-ventrally in ♀, terminal segments in ♂ deflexed; ♂ often with sickle-shaped penis

Fig. 2.



*Pezomyia moseleyi*, sp. n., ♂ ( $\times 6$ ). A, profile of head (enlarged).

projecting from hypopygium. *Wings* showing much individual variation in shape, sometimes normal in outline, sometimes truncate, so that distal margin forms almost a

right angle with costa; veins coarse; costa without spines, relatively coarse and stout from end of first to end of third longitudinal vein; auxiliary (mediastinal) vein indistinguishable; first longitudinal vein very coarse and stout; anterior transverse vein frequently wanting; posterior transverse vein usually wanting, so that discal cell is incomplete, but occasionally present. *Halteres* with elongate knobs. *Legs*: femora swollen; præapical bristle present on all tibiae in ♂, and at least on front and hind tibiae in ♀, fine and hair-like (often difficult to distinguish from surrounding hair) in ♂, conspicuous in ♀; middle and hind tibiae with strong curved spines of medium length at tips; first joint of front tarsi in ♂ armed at distal extremity, on inner side, with a scutiform tooth of chitin.

Typical species, *Pezomyia moseleyi*, sp. n.

*Pezomyia moseleyi*, sp. n. (Fig. 2.)

♂ ♀.—Length, ♂ (16 specimens) 4.75 to 9 mm., ♀ (7 specimens) 6 to 7 mm.; length of wing, ♂ 1.2 to 2.75 mm., ♀ 1.4 to 2 mm.

*Dorsum of thorax* mummy-brown or sepia-coloured, humeral calli smoke-grey or drab-grey, traces of a pair of narrow, admedian, greyish longitudinal stripes usually discernible on anterior portion of dorsum; abdomen clove-brown or greyish clove-brown, in ♂, except at base, thickly clothed with longish, dark brown, silky hair; legs raw sienna- or raw-umber-coloured, conspicuously hairy in ♂.

*Head* (fig. 2, A) drab-grey or smoke-grey, *front*, except orbits (narrowly) and ocellar triangle, darker; epistoma raw-umber-coloured; *front* and upper portion of occipital region clothed with minute black hairs or bristles; jowls thickly clothed with long dark brown hair in ♂, in ♀ sparsely clothed with short hair of same colour; *palpi* ochraceous or tawny-ochraceous, spatulate at distal extremity, clothed with long dark brown hair in ♂ and with shorter hair in ♀; *antennæ* cinnamon-rufous or brownish cinnamon-coloured, third joint mummy-brown, paler at base, first and second joints clothed with black hairs, arista cinnamon-coloured. *Thorax*: pleuræ and pectus greyish-cinnamon or isabella-coloured, mesopleuræ and sometimes also sternopleuræ more or less slate-grey, sternopleuræ clothed with dark brown hair. *Abdomen*: second segment in both sexes nearly twice as long as third; abdomen in ♀ sparsely clothed

with blackish or dark brown hair, shorter and less fine and silky than in ♂. *Wings*: costa and first longitudinal vein buff or ochraceous-buff; anterior transverse vein (when present) and portions of third, fourth, and fifth longitudinal veins adjacent thereto usually dark brown. *Halteres*: stalks ochraceous-buff at base, knobs cream-buff or whitish. *Legs*: hair dark brown, bristles, spines, and claws black, chitinous tooth at distal extremity of inner side of first joint of front tarsi in ♂ black, inner side of first joint of front and hind tarsi and of distal extremity of front and hind tibiae thickly clothed with appressed, shining ochraceous or orange-ochraceous hair, under side of front tarsi with a longitudinal row of short black spines, those at base somewhat longer, stouter, and more conspicuous than remainder; legs in ♀ hairy, but less conspicuously so than in ♂.

Port North (north-west corner of West Falkland), 17. i. 1910, "on a rock, having been driven by the rising tide from a mass of decaying *Macrocystis*."

By desire of the collector and donor, to which the author has much pleasure in acceding, this remarkable species has been named in honour of the late Professor H. N. Moseley, F.R.S., who many years ago met with what was probably the same fly when he visited the Falkland Islands as a naturalist on board H.M.S. 'Challenger'\*.

## MISCELLANEOUS.

*Correction of Generic Name.* By C. FORSTER-COOPER, M.A., University Demonstrator in Comparative Morphology, Cambridge.

OWING to the kindness of Dr. C. W. Andrews, of the British Museum, and of Prof. Trouessart, of Paris, I learn that the generic name *Thaumastotheirus* proposed for a new genus of Perissodactyles in this Journal (No. 70, 1913, p. 376) is preoccupied.

The generic name *Baluchitherium* is therefore proposed as a substitute.

\* Cf. 'Notes by a Naturalist. An Account of Observations made during the Voyage of H.M.S. "Challenger" round the World in the Years 1872-76, under the command of Capt. Sir G. S. Nares, R.N., K.C.B., F.R.S., and Capt. F. T. Thomson, R.N.' By H. N. Moseley, M.A., F.R.S. New and Revised Edition. (London: John Murray, Albemarle Street, 1892.) P. 168.



# THE ANNALS

AND

## MAGAZINE OF NATURAL HISTORY.

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LXIII.—*Descriptions and Records of Bees*.—LV.  
By T. D. A. COCKERELL, University of Colorado.

### *Nomia muscosa*, Cockerell.

This was described from the female; the male hardly differs in appearance, and has the hind legs very little modified. The hind tibiae have white hair on the outer side, and short, shining, purplish-brown hair on the inner, only well seen in an oblique view. The antennae are dark. Males before me are from Mackay, Queensland, Jan., March, November, 1900 (*Turner*, 618), and New South Wales (*Nat. Mus. Victoria*, 71).

### *Nomia hippophila purnongensis*, subsp. n.

♂.—Head and thorax olive-green, with coppery tints; abdomen bright olive-green; tegulae fulvous (or with a black basal shade), with pallid margins; flagellum black above, fulvous beneath except at apex; hind femora much swollen, metallic green, red at apex; hind tibiae mainly green.

Length about 7 mm.

*Hab.* Purnong, Australia, two (*Fulton*; *Nat. Mus. Victoria*, 159, 217).

*N. hippophila*, Ckll., is closely allied to *N. flavoviridis*, Ckll., and perhaps to be regarded as a southern subspecies. Males of *N. hippophila* before me are from "Windsor,

*Ann. & Mag. N. Hist. Ser. S. Vol. xii.* 36

Victoria" (*French*; Froggatt, 187), and near Melbourne (*F. P. Spry*; Nat. Mus. Vict. 201, 202, 203, 255).

A new locality for *N. flavoviridis* is Wagga, N.S.W. (*Froggatt*, 154).

*Nomia flavoviridis cyanella*, subsp. n.

♂.—Length about  $6\frac{1}{2}$  mm.

Head and thorax dark bluish green; abdomen and area of metathorax dark greenish blue; legs rufo-piceous, with metallic tints, hind femora shining greenish blue; flagellum piceous above, bright ferruginous beneath; tegulae rufo-piceous; stigma and nervures dull brown; hind border of mesothorax with two spots of white pubescence. Tongue dagger-shaped.

*Hab.* Cooktown, Queensland, October 1902 (*Turner*).

*Nomia flavoviridis phanerura*, subsp. (sp.?) n.

♀.—Length about 7 mm.

Head and thorax dark bluish green, area of metathorax yellowish green; mesothorax dull and granular, the scattered larger punctures hard to observe, its posterior corners with patches of white hair; tegulae large, bright apricot-colour. Wings with the apical field distinctly dusky; stigma and nervures red-brown. Abdomen with the first segment dark green, the others practically black, but the apical depressed parts of all the segments shining golden green; hair-bands on segments 2 to 4, and patches on sides of first, light fulvous, bands on 3 and 4 very broad; fifth segment and apex ferruginous.

*Hab.* Mackay, Queensland, May 1900 (*Turner*, 1088).

Resembles *N. gracilipes*, Smith, in the red apex of abdomen, but differs in the colour of head and thorax, of abdominal bands, &c.

I formerly held this to be the female of true *N. flavoviridis*, but, although it resembles the male in the colour of the tegulae, I believe that the different female associated (*Turner*, 434) with *flavoviridis* by the collector really belongs to it. This female is larger than *phanerura*, and has the mesothorax somewhat shining, with the scattered larger punctures quite distinct. The tegulae, however, are dark brown, with hyaline borders. The abdominal hair-bands are white, as in the male. The wings are as in the male, with broad second s.m.

The female of genuine *flavoviridis*, as here interpreted, is also before me from Brisbane, May 20, 1912 (Queensl. Mus.

62), and Stradbroke Island, Oct. 2, 1911, and Dec. 3, 1912 (*Hacker*; Queensl. Mus. 24 and 78); a male comes from Brisbane, March 25, 1912 (*Hacker*; Queensl. Mus. 61). A smaller, hardly typical female is from "Windsor, Victoria" (*French*; Froggatt, 94), and a series of three still smaller females, with the general coloration of var. *doddii*, Ckll., comes from Brisbane, Sept. 12, 1911, and March 18, 1912 (*Hacker*; Queensl. Mus. 23 and 71), and "Rutherglen, Victoria" (*French*; Froggatt, 171). When a row of the small females, with the apical part of the abdomen golden-green, is contrasted with a row of larger, darker, more blue-green *flavoviridis*, it is difficult not to believe that we have two species. I am, however, at a loss to find any really satisfactory specific characters, and if there are really two distinct things, it must be for the Australian entomologists to demonstrate it.

*Nomia gracilipes*, Smith.

A female labelled "Gunbower" (*J. A. Kershaw*; Nat. Mus. Vict. 66) agrees with Smith's description, except that it is about 9 mm. long. The abdomen has the first three segments dark blue, with patches of pure white hair on the lateral apical margins, and the remaining segments very dark red suffused with black. The mesothorax is dull, with scattered large punctures and small ones between them. The species is nearest to *N. australica*, Smith.

*Nomia mærens*, Smith.

This was described from "Australia." Females before me from the National Museum of Victoria (67, 68, 257) are labelled "Wandin" (*Jarvis*) and "Fern Tree Gully," 12. 11. 06 (*F. P. Spry*).

*Nomia ferricauda*, sp. n.

♀.—Length about 8 mm.

Black, with the apical depression of the third abdominal segment, and all the segments beyond, clear ferruginous; head broad, face with thin white hair, vertex with brownish-white hair; mandibles with a ferruginous patch; tongue dagger-like; clypeus irregularly punctured, depressed in middle; flagellum obscure red beneath; mesothorax dull, with scattered large punctures and numerous extremely minute ones; scutellum dull and minutely granular, with very few large punctures; area of metathorax striate; poste-

rior truncation brilliantly shining, with sparse small punctures; sides of thorax with white hair, but dorsum with scanty black hair; tegulae piceous. Wings faintly dusky, stigma piceous, nervures sepia; second s.m. rather broad. Legs dark, with pale hair, ferruginous on inner side of tarsi; hair of tibiae partly dark. Abdomen shining, very minutely punctured; first two segments with patches of white hair on lateral hind margins; third and following segments with broad bands of light orange hair, but extreme sides of third with a little white.

*Hab.* Brisbane, Queensland, Sept. 25, 1911, and Sept. 24, 1912 (*H. Hacker*; Queensl. Mus. 80, 59). One is also labelled "Sunnybank."

Easily known from all other Australian species by the black and red abdomen.

*Nomia grisella*, sp. n. (*muscosa*, subsp.?).

♀.—Length about 9 mm.

Black; very closely allied to *N. muscosa*, Ckll., differing as follows:—Third joint of labial palpi longer; mesothorax not so hairy, the dull, very finely punctured surface visible; hind margins of second and following abdominal segments light testaceous. Compared with *N. gilberti*, Ckil., it differs by the strong keel down the middle of upper part of face; reduced metathoracic enclosure, and sides of metathorax densely hairy right up to enclosure; very dark fuscous hair on inner side of hind basitarsi, &c. The abdomen is much less distinctly and strongly punctured than in *muscosa*, especially on the first segment. The second s.m. is narrow, and the tongue is long and filiform.

*Hab.* Cape York, Queensland, April 1902 (*Turner*).

*Nomia brisbanensis*, sp. n.

♀.—Length  $9\frac{1}{2}$  mm.

Black, with greyish-white pubescence, the mesothorax and scutellum with fine grey tomentum, and numerous erect, bristle-like, black hairs; head broad; tongue elongate dagger-shaped; mandibles black, stained with red about middle; clypeus with irregular subconfluent punctures; front dull and granular; flagellum dark red beneath; mesothorax dull and granular; modified basal area of metathorax a narrow transverse band, shining and cross-striated, narrowed in the middle, and bounded posteriorly by a sharp rim; tegulae of moderate size, ferruginous, with the extreme base fuscous. Wings dusky, nervures and stigma sepia, second



s.m. comparatively broad. Legs dark, with light hair, partly dark on tibiæ; hair on inner side of basitarsi pale orange to yellowish white. Abdomen dullish, the minutely punctured surface appearing granular; a small patch of white hair at each side of first segment, and entire or nearly entire conspicuous white hair-bands on second to fourth; hair at apex dark reddish fuscous.

♂.—Similar in most respects; eyes strongly converging below; broad lower margin of clypeus honey-colour; antennæ very long, the flagellum 5 mm., reddish and strongly crenulate beneath; scape red in front; tongue as in female; hind margins of second and following segments pallid; anterior and middle tibiæ at apex and base, and wholly in front, hind tibiæ except a large patch on outer side, and all the tarsi rather dull ferruginous; hind femora strongly incrassate; hind tibiæ also thick, with an obtusely angular projection on inner side near apex.

I thought at first that this might be a colour-variety of *N. frenchi*, Ckll., but the fourth ventral segment in middle is smooth and shining, with a strong sulcus, which ends a little before the emarginate apex; whereas the fourth ventral in *frenchi* is roughened and slightly ridged in middle, with a rudimentary sulcus at extreme base.

*Hab.* Brisbane, Queensland (type-locality), females, Sept. 18, 1911, and Oct. 3, 1912 (*H. Hacker*; Queensl. Mus. 42, 79); Stradbroke Island, male, Dec. 3, 1912 (*H. Hacker*; Queensl. Mus. 85). A female with darker tegulæ and ochraceous-tinged abdominal bands is labelled "Oakleigh, Victoria" (*French*; Froggatt, 183).

Closely related to *N. mærens*, Smith, but less robust and with much lighter tegulæ. In *N. mærens* the basal area of metathorax is not narrowed in the middle. *N. generosa*, which is supposed to be the male of *mærens*, has not enlarged hind femora and tibiæ.

### *Euryglossa aurescens*, sp. n.

♀.—Length a little over 7 mm.

Similar to *E. ephippiata*, Smith, but smaller, with the red thoracic colour much lighter, inclining to orange; post-scutellum black; wings hyaline; mesothorax less strongly punctured.

*Hab.* Mackay, Queensland, Nov. 1891 (*Turner*, 701).

I had determined this as *E. ephippiata*, but the real species of that name is now before me (Healsville, Victoria; Nat. Mus. Victoria, 184), and is clearly distinct.

*Euryglossa tridentifrons*, sp. n.

♂.—Length nearly 5 mm.

Head and thorax black and chrome-yellow, with a little pale hair; labrum, mandibles (except reddish tips), whole of face below antennæ, very broad lateral face-marks (ending above middle of front), a large frontal patch (continuous with the supraclypeal area, sending a narrow pointed process upward, and having large lateral processes curving over the antennæ), and the cheeks all bright yellow; antennæ relatively short, like those of a female; scape yellow; flagellum light ferruginous, a little dusky above; front dullish, vertex more shining; mesothorax black, not evidently punctured, the margin and two longitudinal stripes yellow; scutellum black, with the posterior margin and sides, also the axillæ, yellow; postscutellum black anteriorly, yellow posteriorly; metathorax black, reddish at sides, its base dullish, the truncation shining; prothorax and pleura yellow, marked with black; tegulae pale reddish testaceous. Wings hyaline, stigma and nervures pale reddish; second s.m. longer than high, receiving the second r.n. nearer its apex than the first to its base. Legs yellow, the femora with dark streaks and the hind tibiæ somewhat dusky on outer side. Abdomen dark reddish, the bases of the segments abruptly and broadly pale red (only at sides on fourth), these basal bands possibly yellow in life.

*Hab.* "Nagambie, Victoria" (*French*; Froggatt, 194).

A distinct little species, peculiar for the combination of yellow markings on head and thorax and reddish abdomen. The trifid or tridentate frontal mark is also distinctive.

*Euryglossa albocuneata*, sp. n.

♀.—Length a little over 5 mm.

Very robust and compact; head, thorax, and legs black, with white markings; abdomen with the hind margins of the segments pallid; head large and broad; middle of face and clypeus depressed, concave; clypeus very delicately longitudinally striate, with a median impressed line; lateral face-marks present, consisting of large white triangles, filling space between clypeus and eye, and extending above to level of antennæ, the upper outer corner with a very small projection along the orbit; flagellum short and stout, obscure reddish beneath; upper edge of prothorax narrowly (interrupted in middle), tubercles (except a small spot), and a spot on the reddish tegulae white; mesothorax broad, dull, so

minutely punctured as to appear granular; metathorax feebly shining. Wings hyaline, with sepia nervures and stigma; b. n. not much bent, falling a little short of t.-m.; second s.m. broad, receiving first r. n. very near its base and the second not so near its apex. Knees and bases of tibiae more or less white.

*Hab.* "Windsor, Victoria" (*French*; Froggatt, 192).

A very distinct species, not a typical *Euryglossa*. The third discoidal cell is not produced apically, as it is in *E. geminata*.

*Euryglossa cincticornis*, sp. n.

♂.—Length nearly 7 mm.

Black, with long pale hair on face, cheeks, and anterior femora, but hardly any hair on the dorsal surface; head broad; clypeus closely punctured, but shining; suture bounding clypeus above strongly impressed; front and vertex dull and granular; scape black; flagellum very long, black, with a red band covering two and a half joints above (more below) beyond the middle; last joint broad, compressed, shining on one side; mesothorax and scutellum very densely punctured, but shining between the punctures; area of metathorax shining; tegulae piceous. Wings strongly dusky, stigma and nervures dark reddish brown; b. n. moderately bent, falling far short of t.-m.; second s.m. very much broader than high, receiving first r. n. very near base and second not quite so near apex; the outer side of third discoidal cell, if produced upwards, would be parallel with outer side of second s.m. Legs black, with white hair, intermediate tarsal joints broad and short, with a cup-like outline. Abdomen broad, black, with a dullish surface; seventh segment triangular, pointed, with a large, brilliantly shining, triangular space.

*Hab.* Warburton, Victoria (*F. P. Stry*; Nat. Mus. Victoria, 250).

Evidently related to *E. nigra*, Smith, but conspicuously differing in the colour of the legs and venation. These insects belong to the subgenus *Euryglossimorpha*, Strand, which should, perhaps, be regarded as a distinct genus.

*Euryglossa apicalis*, sp. n.

♂.—Length about 7 mm.

Rather slender, black, with scanty white hair, that on cheeks only about half as long as in *E. cincticornis*; facial quadrangle much longer than broad; mandibles with a red

subapical band; clypeus shining, well punctured; front and vertex dull; antennæ slender, black, the flagellum light fulvous beneath except apically; last joint not modified; mesothorax and scutellum shining, very distinctly and quite closely punctured; base of metathorax shining; pleura dull and granular; tegulæ dark brown. Wings strongly dusky, stigma and nervures dark reddish; b.n. falling far short of t.-m.; first r.n. meeting first t.-c.; second r.n. meeting second t.-c.; second s.m. broad, but not nearly so broad as that of *E. cincticornis*. Legs black, with the knees and anterior tibiæ in front ferruginous; tarsi dark reddish brown. Abdomen with surface and colour as in *E. cincticornis*, but narrower; apex pointed.

*Hab.* Croydon, Australia (*S. W. Fulton*; Nat. Mus. Victoria, 166).

Compared with *E. tenuicornis*, Ckll., this differs by being less robust, with shorter antennæ and different venation.

*Euryglossa inconspicua*, sp. n.

♀.—Length about 5 mm.

Black, robust, with scanty pale hair; head and thorax with very faint and obscure dark greenish tints; head broad; clypeus shining, punctured, pure black, contrasting with the greenish sides of face; front dull; flagellum rather obscurely fulvous beneath; mesothorax obscurely greenish, purplish black posteriorly, with a sericeous surface and very sparse feeble punctures; scutellum shining, very sparsely punctured; metathorax granular, dullish; tegulæ testaceous. Wings hyaline, nervures and stigma reddish brown, some of the outer nervures pale; stigma very large; b.n. falling short of t.-m.; second s.m. broad, but its lower side little longer than its outer, the recurrent nervures joining it near base and apex; the outer side of third discoidal cell, if produced upward, would be practically parallel with outer side of second submarginal. Femora black, with red knees; tibiæ and tarsi bright ferruginous. Abdomen broad, black, shining, the hind margins of the segments obscurely reddish.

*Hab.* Purnong, Australia (*S. W. Fulton*; Nat. Mus. Victoria, 222).

Curiously like *Pachyprosopis atromicans*, Ckll., also found at Purnong, but differing in sculpture as well as venation.

*Euryglossa fasciatella*, Cockerell.

I have before me both sexes labelled "Cheltenham, Victoria" (*French*; Froggatt, 189, 185). The male, not



previously known, is about  $6\frac{1}{2}$  mm. long, black, with much loose long hair, which is faintly ochreous above; antennæ dark, the flagellum very faintly reddish beneath; all the tarsi light reddish; anterior tibiæ ferruginous basally and in front; hind tibiæ chestnut-red, with glittering white hairs; all the knees red.

*Pachyprosopis aurantipes*, sp. n.

♂.—Black, with bright orange-yellow legs and scape; flagellum pale fulvous, dusky above; labrum and mandibles yellow; eyes converging below and face densely covered with appressed, shining, light brownish-golden hair. Except for the sexual differences, this looks exactly like *P. angophoræ*, Ckll., but it seems to be a distinct species, having the mesothorax and scutellum sparsely and feebly punctured, whereas they are closely punctured in *angophoræ*.

*Hab.* "Windsor, Victoria" (*French*; Froggatt, 197).

The following key separates the species of *Euryglossa* and *Pachyprosopis* described above from each other and from several other species:—

- |   |    |   |
|---|----|---|
| Mesothorax red .....  | 1. |   |
| Mesothorax not red .....  | 2. |   |
| 1. Postscutellum red; wings dusky .....   |    | <i>E. ephippiata</i> , Sm.                            |
| Postscutellum black; wings clear .....  |    | <i>E. aurescens</i> , Ckll.                           |
| 2. Mesothorax blue. (Croydon; <i>Fulton</i> ,<br>Nat. Mus. Vict. 198.) .....  |    | <i>Pach. hæmatostoma</i> , Ckll.                      |
| Mesothorax black (very faintly greenish<br>in <i>E. inconspicua</i> ) .....   | 3. |   |
| 3. Mesothorax with yellow stripes and<br>margin .....   |    | <i>E. tridentifrons</i> , Ckll.                       |
| Mesothorax without yellow stripes and<br>margin (rudiments of these in <i>E. calli-</i><br><i>opsiformis</i> , var. <i>a</i> ) .....                                      | 4. |   |
| 4. Face with light markings .....   | 5. |   |
| Face all dark .....   | 6. |   |
| 5. Light markings two large creamy-white<br>lateral marks .....   |    | <i>E. albocuneata</i> , Ckll.                         |
| Light markings yellow, and not confined<br>to lateral marks; faint traces of yellow<br>mesothoracic bands. ("Rutherglen,<br>Victoria"; <i>French</i> , Froggatt, 170.) .. |    | var. <i>a</i> .<br><i>E. calliopsiformis</i> , Ckll., |
| 6. Legs entirely bright orange .....  |    | <i>Pach. aurantipes</i> , Ckll.                       |
| Legs not so .....   | 7. |   |
| 7. Male flagellum black, with a red ring on<br>two and a half joints .....  |    | <i>E. cincticornis</i> , Ckll.                        |
| Male flagellum beneath light fulvous,<br>with the apex broadly black, con-<br>trasting; hind tibiæ black .....  |    | <i>E. apicalis</i> , Ckll.                            |
| Flagellum otherwise .....   | 8. |   |

8. Upper outer angle of second s.m. not greater than a right angle; tibiæ and tarsi red ..... 9.  
 Upper outer angle of second s.m. greater than a right angle ..... 10.
9. Stigma pallid. (Purnong; *Fulton*, Nat. Mus. Vict. 219.) ..... [var. *a.*  
*Pach. atromicans*, Ckll.,  
 Stigma dark sepia. (Croydon; *Fulton*, Nat. Mus. Vict. 190, 162; also Windsor; *French*, Froggatt, 190.) .. *Pach. atromicans*, Ckll.
10. Larger species, with black hind tibiæ .. 11.  
 Smaller species, with red hind tibiæ.... 14.
11. Mesothorax dullish, without strong punctures ..... *E. fasciatella*, Ckll.  
 Mesothorax with strong punctures; abdomen metallic or submetallic .... 12.
12. Disc of mesothorax with strong punctures. (Croydon; *Fulton*, Nat. Mus. Vict. 93.) ..... *E. nigrocærulea*, Ckll.  
 Disc of mesothorax with sparse feeble punctures ..... 13.
13. Larger; sides of mesothorax more finely punctured; flagellum dark. (Croydon; *Fulton*, Nat. Mus. Vict. 237; also Dandenong, Nov. 1902; *T. Kershaw*, Nat. Mus. Vict. 164.) ..... *E. depressa*, Sm.  
 Smaller; sides of mesothorax more coarsely punctured; flagellum fulvous beneath. (New South Wales; Nat. Mus. Vict. 165.) ..... *E. jucunda*, Sm.
14. Mesothorax not evidently punctured .. 15.  
 Mesothorax closely punctured; males .. 16.
15. Middle tibiæ clear red ..... *E. inconspicua*, Ckll.  
 Middle tibiæ dark except at base; male. *E. fasciatella*, Ckll.
16. Flagellum apricot-colour above and beneath. (National Park; *Lea*, 10711; Froggatt, 137.) ..... *E. chrysoceras*, Ckll.  
 Flagellum dark, at least above. (National Park; *Lea*, 10717; Froggatt, 142; also variety with flagellum light red beneath; "Nagambie, Victoria"; *French*; Froggatt, 195.) ..... *E. reginae*, Ckll.

LXIV.—*New Anthracotheres and allied Forms from Baluchistan.—Preliminary Notice.* By C. FORSTER-COOPER, M.A., University Demonstrator in Comparative Morphology, Cambridge.

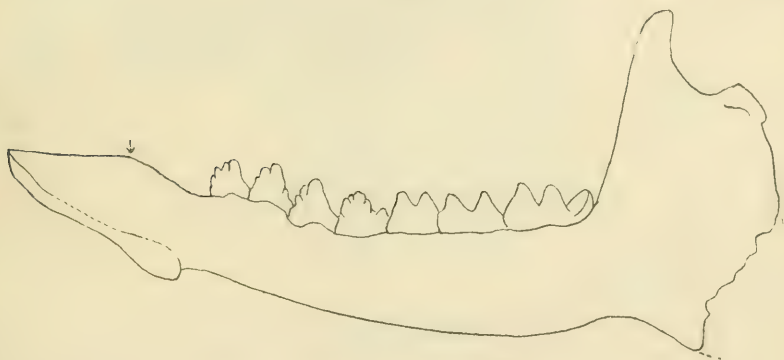
THE following forms are part of a large collection from the Upper Oligocene deposits of Dera Bugti in Baluchistan. With the exception of fig. 1 all the figures are of natural size.

*Gelasmodon gracilis*, gen. et sp. n.

The type-specimen (fig. 1) is a fairly complete mandible of long and slender build, somewhat similar to that found in the genus *Ancodon*, as, for example, that of *Ancodon gorringei*\*. It presents, however, certain minor differences in general shape and very pronounced differences in the dentition.

The mandible has, in the first place, a very marked curve along the lower border, which rises gradually from the point of greatest depth between the second and third molars up to the end of the symphysis. In *A. gorringei* the border is straighter, sloping up a little from the same point of greatest depth, and then flattening out or even turning down somewhat at the symphysis.

Fig. 1.

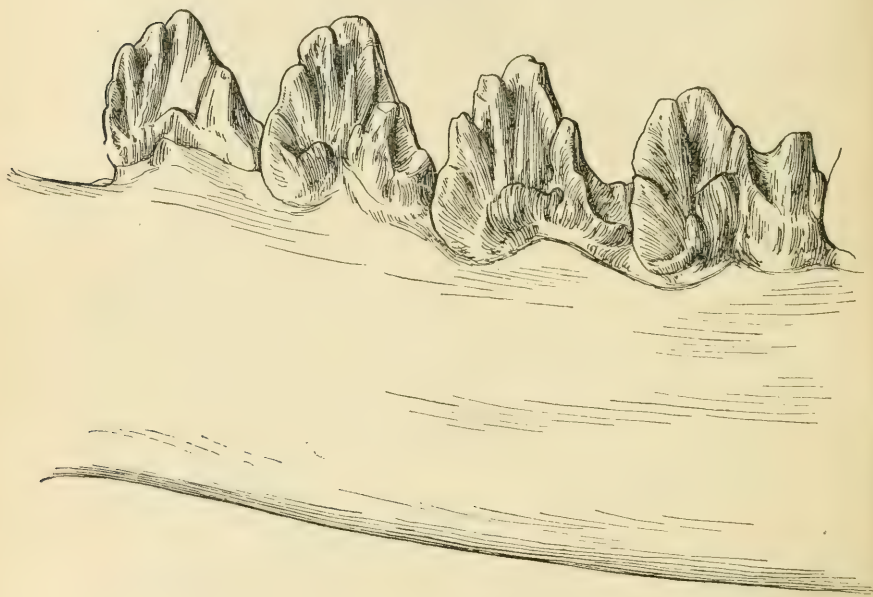


The dentition is peculiar. There is a closed series of three molars and four premolars. A long diastema then separates the first premolar from the next tooth, which is presumably the canine. This tooth is very small and only just cuts the gum; its position is marked by the arrow in the figure. In front of this tooth the alveolar border is exceedingly thin, sharp-edged, and without trace either of teeth or of any sockets to contain them. It would appear that this animal was toothless in this region or else had the teeth much reduced, as there is hardly enough substance at the edge of the jaw to carry an average-sized incisor such as is found in the genus *Ancodon* generally. The position of the first premolar close against the second is also a point of difference.

\* Andrews, 'Catalogue of the Tertiary Vertebrata of the Fayûm' (British Museum).

The structure of the premolars forms a clearly distinguishing feature. They are remarkable for a curious ornamentation in the pulling out of their edges into a number of pointed styles in a manner best explained by the figure (fig. 2), which shows the inner sides of the four premolars. The molars do not show this feature, but are very hypsodont and selenodont.

Fig. 2.



The jaw measures 40 cm. in length and 5.7 cm. at its greatest depth.

*Brachyodus pilgrimi*, sp. n.

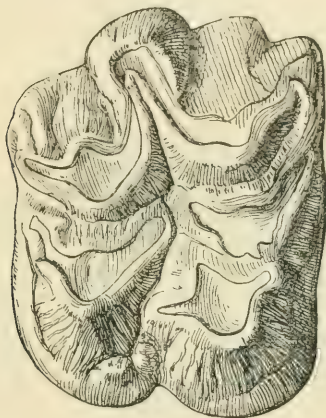
The type-specimen consists of a third upper molar of the right side, with sockets of the first and second molars and part of the maxillary bone as high as the lower border of the orbit. The tooth only is drawn in the figure (fig. 3). This form closely approaches *B. giganteus* in tooth-pattern, but is larger and considerably wider in proportion to its length, the measurements being over 5.3 cm. for the breadth (the outer part of the parastyle is broken away, or the breadth would be a little more) and 4.1 for the length. The tooth is very



brachydont, the enamel coarsely striated, and there is a fairly well-marked cingulum all round except on the outer border. The depth from the socket of the last molar to the lower border of the orbit is approximately 8.5 cm.

A comparison of this specimen with about twenty or more fragments of *B. giganteus* and *B. hyopotamoides* makes it unlikely that it can be an extra large specimen of one or other of these two forms. There is, nevertheless, a very wide range

Fig. 3.



of variation in size in these two forms, some specimens of *hyopotamus* being larger than *giganteus*, as, indeed, the type is. Pilgrim, however\*, finds that in his collections *giganteus* is, on the whole, the larger form.

*Hemimeryx lydekkeri*, sp. n. (Fig. 4.)

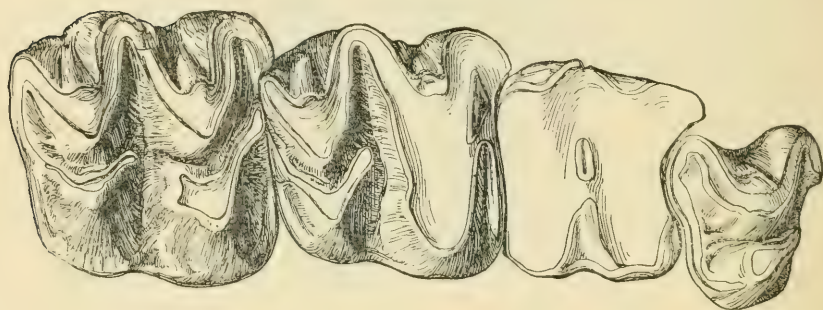
The type-specimen is a right maxilla with the three molars and the last premolar. With this fragment are associated a left maxilla with three molars and some separate teeth. The premolar has two cusps, the outer being extremely crescentic and produced into a strong loop at each corner. The cingulum is well marked all round the tooth.

The first molar is too worn to admit of much description. The second and third molars may be described together: there are only the four principal cusps, all extremely selenodont

\* Pilgrim, "The Vertebrate Fauna of the Gaj Series in the Bugti Hills &c.," *Paleontologia Indica*, new series, vol. iv. memoir 2 (1912).

except that the hinder horn of the protocone is reduced and does not turn towards the middle of the tooth. On the outer side the parastyle and mesostyle are prominent and the "barrels" of the paracone and metacone well marked, a point of distinction from *H. blandfordi* (Lyd.), where they are stated to be weakly developed. The metastyle is well developed on the last molar, but very weak on the second. This is due to the size of the parastyle of the last molar, which curls round the metastyle of the second and prevents its development. It seems probable, therefore, that the type-tooth of *H. blandfordi*, which shows a weak parastyle, is the second and not the third molar.

Fig. 4.



The characters of this genus, according to Lydekker \* and Pilgrim †, are (1) the absence of a protoconule, (2) a prominent and complete mesostyle, (3) an incompletely crescentic protocone.

The genus *Telmatodon* (Pilgrim) differs chiefly in its greater bunodonty, in the presence of a very small protoconule, and, as far as my specimen (*i. e.* of *Telmatodon*) is concerned, in having smooth enamel. The two genera, however, are closely allied.

In addition to the form under discussion, three species of *Hemimeryx* have been described—*blandfordi* (Lyd.), *pusillus* (*Merycopotamus pusillus*, Lyd.), and *speciosus* (Pilg.); the last two are small forms, while *blandfordi*, if the tooth is the last molar, approaches the present form more closely in size, but differs in the form of the paracone and metacone.

\* Lydekker, Rec. Geol. Surv. Ind. xi. p. 80.

† Pilgrim, *loc. cit.*

Measurements:—

	Length.	Breadth.
	cm.	cm.
PM <sup>1</sup> .....	2.1	2.3
M <sup>1</sup> .....	2.6	2.7
M <sup>2</sup> .....	3.2	3.3
M <sup>3</sup> .....	3.9	3.6

*Microbunodon sminthos*, sp. n. (Fig. 5.)

The type-specimen is a fragment of a mandible with the last two molars. It somewhat resembles *Anthracotherium gresslyi* (Lyd.) in size and general appearance, but differs in

Fig. 5.



the proportions of the teeth, which are less broad for their length. All the cusps are very bunodont and brachydont, the protocone being the only one which is at all crescentic. The talonid is broad.

Measurements:—

	Length.	Breadth.
	cm.	cm.
M <sub>2</sub> .....	0.85	0.6
M <sub>3</sub> .....	1.35	0.7
Depth of ramus below M <sub>3</sub> .....	2.35 cm.	

*Brachyodus strategus*, sp. n. (Fig. 6.)

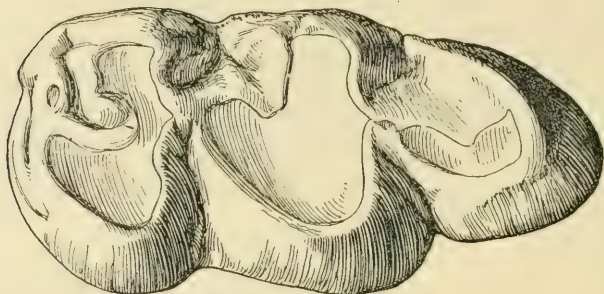
Among a rather large variety of lower jaws and teeth are one or two specimens which do not seem to fit in with any of the upper jaw fragments, nor can I find them mentioned or illustrated in Pilgrim's report of his collections from the same locality\*. The present specimen and the next one to be described seem to have characters sufficient to give them specific rank.

*B. strategus* is represented by a third lower molar of the left side. It is much too large to serve for *B. pilgrimi* described above: in fact, it would serve for the smaller varieties of *Anthracotherium magnum*. The reasons, however, that it is placed in the genus *Brachyodus* are, firstly, the considerable selenodonty of the inner cusps and, secondly,

\* Pilgrim, *loc. cit.*

the fact that the posterior arm of the hypoconid unites with the entoconid, a point brought out by Pilgrim. Moreover, I have a number of fragments belonging to the *Anthracotherium magnum-bugtiense* group, and the lower molars of

Fig. 6.



these present very great differences from the tooth under discussion.

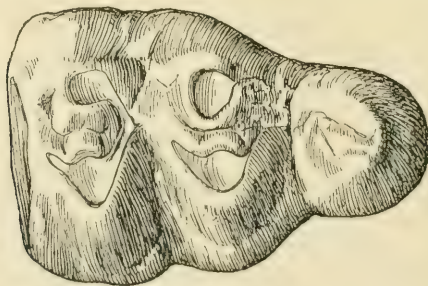
The measurements of the tooth are:—

	cm.
Length.....	7.9
Breadth, front half.....	3.7
„ hind half.....	3.7

*Brachyodus* (?) *obtusus*, sp. n. (Fig. 7.)

This tooth is also a third left lower molar. It is a stout tooth, very brachydont and bunodont. Its chief peculiarity,

Fig. 7.



however, lies in its shape, the front half being much broader than the hind half, which gives it a striking appearance.



The talonid is broad, there is an absence of secondary cusps in the transverse valleys, and no cingulum, except a small ledge at the front outer edge. The centres of the cusps lie rather close together, and their sides slope very gradually down to the level of the socket.

Measurements :—

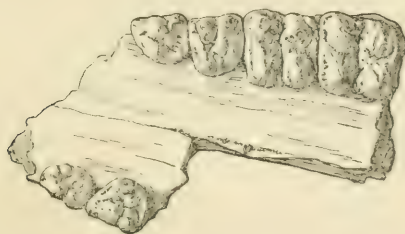
	cm.
Length .....	5·7
Breadth, front half.....	3·6
„ hind half .....	3·0

*Hyotherium* (?) *jeffreysi*, sp. n. (Fig. 8.)

The type-specimen is a fragment of a palate showing the second and third premolars on the right side and the third and fourth premolars and first two molars on the left.

The molars are square in shape, with a stout cingulum in front, which in the first molar continues outside and behind, while in the second it ceases round the metacone, to reappear as a small tubercle on the middle of the hinder border. The cusps are all conical, except that the protocone and hypocone in each tooth send out a ridge forwards and diagonally across, presumably to a protoconule and metaconule respectively, though these cusps are not very prominent. The enamel is somewhat weathered, but shows a good deal of wrinkling into secondary cuspules.

Fig. 8.



Of the premolars, the fourth has two well-marked outer cusps joined by various wrinkles of the surface to an inner cusp. The third is the same in general pattern, but the posterior outer cusp is smaller and the inner cusp slopes away behind to a circular depression in the talonid. (In the figure this is better shown in the left tooth.) The second premolar has two outer cusps, the hind one again being

rather the smaller. The cingulum, again, shows the same depression behind, but to a less extent, and hardly forms an internal cusp.

The palate is narrow, and the fragment, viewed from the upper surface, indicates a longish and rather pointed snout.

The attribution of this species to the genus *Hyotherium* is tentative.

I name this species after my friend Dr. W. M. Jeffreys, who accompanied me on my first expedition to Baluchistan and to whose energy and skill in collecting I owe a great deal.

The measurements of the teeth are:—

	Length.	Breadth.
	cm.	cm.
PM <sup>2</sup> .....	0·7	0·55
PM <sup>3</sup> .....	0·8	0·7
PM <sup>4</sup> .....	0·75	0·8
M <sup>1</sup> .....	1·0	1·0
M <sup>2</sup> .....	1·0	1·1 (front half).

LXV.—*Characters of new Genera and Species of Terrestrial Mollusca from Norfolk Island.* By H. B. PRESTON, F.Z.S.

THROUGH the kindness of Messrs. Gregory M. Mathews and T. Iredale, all the terrestrial and fluviatile shells collected by Mr. Roy Bell during his recent prolonged stay on Norfolk Island have been handed to the author, from which material the following species are diagnosed, no figures being given at present, as it is intended to do this in a forthcoming work dealing exclusively with the fauna of that island and the adjacent islets.

DENDROLAMELLARIA, gen. nov.

Shell vitriniform, transparent, with smooth apical whorls and minutely *transversely striate* last whorl.

Genotype: *D. mathewsi*, Preston.

The genus, which is arboreal in its habits, resembles almost exactly in form the marine genus *Lamellaria*; it probably belongs to the family *Limacidae*.

*Dendrolamellaria mathewsi*, sp. n.

Shell rather large, whitish, transparent, shining, with

exserted spire; whorls 3, the first very small, the remaining two very rapidly increasing, the last sculptured with very fine, microscopic, closely set, transverse, silky striæ; suture impressed, narrowly margined below; columella margin curvedly excavated above, very obliquely descending below; labrum submembranaceous at the extreme edge, advancing in front, receding above and below; aperture very large, ovately subrectangular.

Alt. 15·5, diam. maj. 18·75, diam. min. 14 mm.

Aperture: alt. 12·25, diam. 14 mm.

Hab. Ball's Bay, Norfolk Island (*R. Bell*).

ALLENOCONCHA, gen. nov. (*Zonitidae*).

Shell thin, corneous, depressedly turbinate or almost planulate, imperforate, microscopically spirally striate.

Genotype: *A. basispiralis*, Preston.

*Allenconcha basispiralis*, sp. n.

Shell turbinate, thin, semitransparent, polished, shining, pale reddish brown; whorls 5, flattish, regularly increasing, the last rather sharply angled at the periphery, marked with radiate growth-plicæ, and sculptured with microscopic, closely set, wavy, spiral striæ; suture rather lightly impressed, narrowly margined below; base of shell convex, sculptured with similar striæ to those on the spire; columella outwardly expanded, obliquely and rather steeply descending; labrum acute; aperture obliquely, broadly, and compressedly sub-lunate.

Alt. 2·5, diam. maj. 4·5, diam. min. 4 mm.

Hab. Ball's Bay, Norfolk Island (*R. Bell*).

*Allenconcha belli*, sp. n.

Shell small, depressedly conoid, with somewhat convex base, slightly polished, yellowish brown; whorls 4, regularly increasing, the last angled at the periphery, microscopically sculptured with fine, wavy, closely set, spiral striæ; suture impressed, narrowly margined below; columella margin white, narrowly reflexed throughout, somewhat oblique, curved; labrum simple; aperture very broadly and a little obliquely sub-lunate.

Alt. 2, diam. maj. 3·5, diam. min. 3·25 mm.

Hab. Steel's Point, Norfolk Island (*R. Bell*).

*Allenconcha matthewsi*, sp. n.

Shell depressedly turbinate, pale yellowish brown; whorls 5, regularly increasing, the last angled at the periphery, microscopically sculptured with very fine, slightly wavy, closely set, spiral striæ; suture impressed, very narrowly, callously margined below; columella margin a little reflexed above, very obliquely descending in a slight curve, a well-defined, light, parietal callus joining it with the upper margin of the labrum; labrum simple; aperture obliquely subcrenate.

Alt. 2.25, diam. maj. 4.75, diam. min. 4.25 mm.

*Hab.* Ball's Bay, Norfolk Island (*R. Bell*); also taken by Mr. Bell on Mount Pitt and at Steel's Point.

*Allenconcha mons-pittensis*, sp. n.

Shell perforate, small, depressedly orbicular, polished, shining, yellowish brown, shading in the subsutural region to greyish; whorls 5, flattened, regularly increasing, the last sharply angled at the periphery, marked with indistinct, radiate, transverse growth-plicæ, crossed by very fine, microscopic, closely set, wavy, spiral striæ, which become almost obsolete on the base of the shell; suture lightly impressed, narrowly margined below; perforation very narrow, almost covered by the flattened and rather hooked outward expansion of the basal parietal callus; columella margin interiorly thickened into a broad, excavately arched, pillar-like callus which extends both interiorly and exteriorly as a basal parietal thickening; labrum acute, projecting in front of the pillar-like columella callus; aperture obliquely and rather compressedly sublunate.

Alt. 1.5, diam. maj. 4.25, diam. min. 3.75 mm.

*Hab.* Mount Pitt, Norfolk Island (*R. Bell*).

*Allenconcha perdepressa*, sp. n.

Shell small, very depressed, somewhat iridescent, corneous; whorls 4, regularly increasing, the last angled at the periphery, marked with radiate transverse plicæ, and sculptured with exceedingly fine, closely set, microscopic, spiral striæ; suture impressed, narrowly margined below; columella margin very obliquely descending; labrum simple; aperture obliquely and very compressedly and broadly sublunate.

Alt. 1.25, diam. maj. 3.25, diam. min. 3 mm.

*Hab.* Mount Pitt, Norfolk Island (*R. Bell*).



*Alleniconcha royana*, sp. n.

Shell small, very depressedly turbate, in colour greenish brown; whorls 5, regularly increasing, the last angled at the periphery, sculptured with very fine, microscopic, closely set, wavy, spiral striæ, and marked with radiate growth-plicæ; suture impressed; columella margin very obliquely descending; labrum simple, outwardly extending above, receding below; aperture obliquely subulate.

Alt. 2, diam. maj. 4.75, diam. min. 4 mm.

*Hab.* Duncombe Bay, Norfolk Island (*R. Bell*).

*Alleniconcha congener*, sp. n.

Shell differing from *M. royana* in its darker colour, which is of a deep reddish-brown shade, less depressed form, and less oblique columella margin.

Alt. 3.25 (nearly), diam. maj. 4.75, diam. min. 4.25 mm.

*Hab.* Duncombe Bay, Norfolk Island (*R. Bell*).

GREENWOODOCONCHA, gen. nov. (*Zonitidæ*).

Shell turbate, with somewhat convex base, imperforate, moderately solid, finely spirally striate.

Genotype: *Microcystis nux*, Sykes\*.

*Greenwoodoconcha tomi*, sp. n.

Shell turbate, with convex base, reddish brown, polished, shining; whorls  $4\frac{1}{2}$ , regularly increasing, the last considerably angled at the periphery, sculptured with slightly curved, transverse plicæ and rather closely set, wavy, spiral striæ, which become finer on the last whorl; suture impressed, margined below, the margin being also spirally striate; columella margin reflexed, almost perpendicularly descending above, obliquely curved below, diffused above into a well-defined, whitish, parietal callus which reaches to the upper margin of the labrum; labrum simple; aperture rather obliquely broadly subulate.

Alt. 3, diam. maj. 5.25, diam. min. 4.75 mm.

Aperture: alt. 2, diam. 2.5 mm.

*Hab.* Mount Pitt, Norfolk Island (*R. Bell*).

\* Proc. Malac. Soc. London, vol. iv, 1900, p. 139, pl. xiii, figs. 4 & 5.

ROYBELLIA, gen. nov. (*Zonitidae*).

Shell very depressed, thin, horny, yellowish brown, transversely costulate, strongly and acutely carinate at the periphery, the termination of the costulae projecting beyond the margin of the carina.

Genotype: *Trochonanina platysoma*, Sykes\*.

*Roybellia depressa*, sp. n.

Shell differing from *Trochonanina platysoma*, Sykes, in its much more depressed form, the spire having a laterally concave appearance, the transverse costulae are finer than in *T. platysoma*, and the surface of the shell is microscopically granulate, while the peripheral carina is produced into a projecting flange; the base is also less inflated, thus almost entirely eliminating the umbilical depression which is seen in Sykes's species.

Alt. 1.5, diam. maj. 6.5 (nearly), diam. min. 5.5 mm.

Aperture: alt. 1.5, diam. 3 mm.

Hab. Mount Pitt, Norfolk Island (*R. Bell*).

*Fretum microstriatum*, sp. n.

Shell depressedly turbate, without trace of colour; whorls  $4\frac{1}{2}$ , the last ascending a little in front, regularly and rather rapidly increasing, sculptured with very fine, wavy, closely set, microscopic, spiral striae, and marked with fine, indistinct, transverse growth-plicae; suture rather lightly impressed; base of shell moderately convex; columella margin callously thickened and inwardly bulging above, then slightly excavatedly curved, and obliquely descending below; labrum simple; aperture broadly and depressedly sublunate.

Alt. 10, diam. maj. 16, diam. min. 14 mm.

Aperture: alt. 8, diam. 8 mm.

Hab. Norfolk Island, subfossil in sand near the limestone quarry on the S.E. coast (*R. Bell*).

*Advena campbellii* (Gray), var. *charon*, var. n.

Shell differing from the typical form in having the earlier whorls of a dark crimson colour, below which the whole shell, with the exception of the supersutural, extreme carinal margins and the columella, is of a uniform blackish-brown colour.

Hab. Mount Pitt, Norfolk Island (*R. Bell*).

\* Proc. Malac. Soc. London, vol. iv. 1900, p. 140, pl. xiii. figs. 16, 17.

*Advena campbellii nepeanensis*, subsp. n.

Shell much broader and with less elevated spire than has *A. campbellii* (Gray) \* from Norfolk and Phillip Islands.

Alt. 15, diam. maj. 27, diam. min. 23.5 mm.

*Hab.* Nepean Island, in subfossil condition only (*R. Bell*).

*Fanulum testudo*, sp. n.

Shell roundedly turbinate, with strongly carinate periphery and very slightly convex base, yellowish, irregularly transversely banded and mottled with reddish chestnut above, the transverse banding becoming paler and less marked on the base of the shell; whorls 5, regularly increasing, marked only with transverse ridges, which assume a more definitely sculptural appearance on the latter half of the last whorl; suture very lightly incised, narrowly, but coarsely callously margined above; columella margin white, obliquely descending, bearing an oblique, oblong, tooth-like projection above; labrum simple, acute, receding below; aperture subrectangular; interior of shell showing the reddish-chestnut markings through the test.

Alt. 4.5, diam. maj. 7.75, diam. min. 7 mm.

Aperture: alt. 2.5, diam. 3 mm.

*Hab.* Mount Pitt, Norfolk Island (*R. Bell*).

QUINTALIA, gen. nov. (*Zonitidæ*).

Shell imperforate, turbinately conic, minutely spirally striate, angled at the periphery.

Genotype: *Caracolla stoddarti*, Gray †, from Phillip Island.

*Hab.* Norfolk Island and immediately adjacent islets.

The above genus includes, besides the type-species, *Helix flosculus*, Cox ‡, and the subspecies below described, which would seem to be intermediate between *C. stoddarti* and *H. flosculus*, both of which have been erroneously placed in the New-Zealand genus *Carthea*, the former by Sykes §, the latter by Pilsbry ||.

\* Proc. Zool. Soc. London, 1834, p. 65; Reeve, Conch. Icon., *Helix*, spp. 438 & 765.

† Proc. Zool. Soc. London, 1834, p. 65.

‡ *Id. ibid.* 1865, p. 695; Journ. de Conch. xiv. 1866, p. 48.

§ Proc. Malac. Soc. London, iv. 1900, p. 142.

|| Man. Conch. ser. 2, viii. 1892, p. 77.

*Quintalia stoddarti intermedia*, subsp. n.

Shell intermediate in form and size between *Caracolla stoddarti*, Gray, from Phillip Island, and *Helix flosculus*, Cox, from the mainland; though only found in a subfossil state, some specimens show vividly the subperipheral chestnut band, as well as traces of the transverse colour-blotches above the periphery.

Alt. 8, diam. maj. 13, diam. min. 11·25 mm.

Aperture: alt. 6·75, diam. 6·75 mm.

*Hab.* Nepean Island, in subfossil state only (*R. Bell*).

MATHEWSOCONCHA, gen. nov. (*Zonitide*).

Shell imperforate, heliciform, depressedly turbate, spirally striately sculptured, with thickened and inwardly bulging columella.

Genotype: *M. belli*, Preston.

*Mathewsoconcha belli*, sp. n.

Shell rather small, turbate, dark reddish purple, ornamented with a narrow, peripheral, yellowish band, which appears as a subsutural band on the upper whorls; whorls 4, the last slightly angled at the periphery, flattish, sculptured with fine, closely set, wavy, spiral striæ, and marked with coarse, irregular, and also rather closely set, oblique growth-plicæ; suture impressed; base of shell moderately convex, the spiral sculpture of the spire becoming subobsolete on this portion of the shell; columella margin whitish, outwardly reflexed, obliquely descending and bulging a little inwards in the median part, then slightly notched and again descending obliquely below, spreading above into a very fine, almost imperceptible, minutely granular callus which reaches the upper margin of the labrum; labrum acute, rapidly receding below; aperture obliquely, compressedly, and rather broadly subnate; interior of shell bluish, showing the peripheral band through the test.

Alt. 6, diam. maj. 9·25, diam. min. 8·25 mm.

Aperture: alt. 4·5, diam. 4 mm.

*Hab.* Mount Pitt, Norfolk Island (*R. Bell*).

*Mathewsoconcha albocincta*, sp. n.

Shell rather small, somewhat depressedly turbate, reddish yellow, ornamented with a narrow, white, peripheral band; whorls 4, regularly increasing, sculptured with oblique, radiate,



transverse plicæ, and rather indistinct spiral striæ; suture impressed; base of shell somewhat convex; columella margin callously thickened, forming with the parietal wall a small notch above, below which it descends obliquely to form an obtuse angle with the labrum below; labrum simple.

Alt. 5·5, diam. maj. 8·75, diam. min. 7·5 mm.

Aperture: alt. 4, diam. 4·5 mm.

*Hab.* Norfolk Island, subfossil in sand near the limestone quarry on the S.E. coast (*R. Bell*).

*Mathewsoconcha vexillum*, sp. n.

Shell conoidly turbinate, in subfossil condition white, strikingly painted with a rather narrow, reddish-orange, suprasutural band, which appears as a peripheral band on the last whorl; whorls 5, regularly increasing, the first two a little flattened above, the remainder moderately convex, bearing traces of very fine spiral striæ, and marked with numerous fine oblique growth-ridges; suture impressed; columella margin descending obliquely, developed throughout almost its whole length into a medianly excavated projection, and diffused above into a thin, well-defined, parietal callus which reaches to the upper margin of the labrum; labrum acute, receding below; aperture broadly and compressedly obliquely sublunate.

Alt. 6·25, diam. maj. 9, diam. min. 8 mm.

Aperture: alt. 4·5 (nearly), diam. 3·5 mm.

*Hab.* Limestone Quarry, Norfolk Island, in subfossil condition only (*R. Bell*).

BELLOCONCHA, gen. nov. (*Zonitidæ*).

Shell imperforate, heliciform, turbinate conic, marked only with transverse growth-plicæ.

Genotype: *B. elevata*, Preston.

*Belloconcha elevata*, sp. n.

Shell imperforate, conically turbinate, in subfossil condition white without trace of colouring; whorls 5, regularly increasing, convex, smooth, but for rather oblique growth-ridges; suture impressed, narrowly margined below; columella margin outwardly calloused, descending in a curve; labrum acute; aperture very obliquely broadly sublunate.

Alt. 11, diam. maj. 14·75, diam. min. 12·75 mm.

Aperture: alt. 6·25, diam. 6·75 mm.

*Hab.* Nepean Island, in subfossil state only (*R. Bell*).

*Belloconcha compacta*, sp. n.

Shell imperforate, turbinate, in subfossil condition pale yellowish white, showing traces of a rather narrow, white, peripheral band; whorls  $4\frac{1}{2}$ , very slightly convex, marked only with oblique growth-lines; suture impressed; base of shell moderately convex; columella margin narrowly, outwardly reflexed, obliquely descending and curved below; aperture subovate.

Alt. 6.5, diam. maj. 10, diam. min. 9 mm.

Aperture: alt. 4.5, diam. 4.25 mm.

Hab. Nepean Island, in subfossil state only (*R. Bell*).

*Belloconcha norfolkensis*, sp. n.

Shell somewhat depressedly turbinate, obtusely carinate at the periphery, thin, corneous, light reddish brown, painted with a very narrow sutural band of dark chestnut and a slightly broader, whitish, peripheral band; whorls  $4\frac{1}{2}$ , regularly increasing, rather flat, coarsely sculptured with oblique radiate riblets; base of shell somewhat shining, obsoletely minutely granulate; suture impressed, narrowly margined below; columella tinged with dark chestnut, sharply curved and outwardly expanded above, white and somewhat bulging inwards below; labrum acute, simple; aperture irregularly sublunate.

Alt. 6.5, diam. maj. 10, diam. min. 9 mm.

Aperture: alt. 5.25, diam. 5 mm.

Hab. Norfolk Island.

IREDALEOCONCHA, gen. nov. (*Zonitidae*).

Shell heliciform, depressed, corneous, *imperforate*, having a widely grooved suture, which is continued on the last whorl as a suprapерipheral channel.

Genotype: *I. inopina*, Preston.

The present genus is at first sight almost identical with *Diepenheimia*, which inhabits the Obi Islands, Dutch East Indies\*; this latter is, however, *perforate*, while both the species of *Iredaleoconcha* which have as yet come to light are quite devoid of all trace of perforation.

*Iredaleoconcha inopina*, sp. n.

Shell small, imperforate, suborbicular, depressedly conoid, yellowish, semitransparent, polished, shining; whorls  $3\frac{1}{2}$ ,

\* Ann. & Mag. Nat. Hist. ser. 8, vol. xii. 1913, pp. 433-434.

regularly increasing, the last channelled above and carinate at the periphery, the apical whorls smooth, the later whorls marked with irregular transverse growth-ridges, and sculptured with very distinct, closely set, spiral striæ; suture narrowly callously margined above, deeply channelled below, the sutural channel being continued as the suprapерipheral channel on the last whorl; base of shell inflated, bearing the same sculpture as on the spire; columella margin descending in a very oblique curve; labrum acute, notched at the termination of the suprapерipheral channel; aperture obliquely sublunate.

Alt. .75, diam. maj. 2, diam. min. 1.75 mm.

Hab. Limestone quarry, Norfolk Island; also found on Mount Pitt (*R. Bell*).

*Ireduleoconcha caloraphe*, sp. n.

Shell rather depressedly turbate, brown; whorls 5, regularly increasing, the last narrowly channelled above and carinate at the periphery, sculptured with fine, closely set, spiral striæ, and marked with oblique transverse growth-plicæ; suture channelled, bearing an erect callous ridge above, bordered on the upper side by a rather deep but very narrow groove; base of shell inflated, also sculptured with fine revolving striæ; columella margin vertically descending for a short distance, then sharply angled and very obliquely descending below; labrum acute, notched at the termination of the suprapерipheral channel; aperture broadly and obliquely subrescenscentic.

Alt. 2, diam. maj. 4.25 (nearly), diam. min. 3.75 mm.

Hab. Duncombe Bay, Norfolk Island (*R. Bell*).

PITTOCONCHA, gen. nov. (*Zonitidæ*).

Shell imperforate, corneous, turbate, swollen, peripherally carinate, spirally striate, and transversely costulate.

Genotype: *P. concinna*, Preston.

*Pittoconcha concinna*, sp. n.

Shell small, turbate, with inflated spire, thin, horny, dark blackish brown; whorls 4, regularly increasing, the last strongly carinate at the periphery, sculptured with coarse, closely set, very oblique, and somewhat curved, transverse plicæ, crossed by indistinct spiral striæ, which are more noticeable on the apical whorls and base of the shell; suture impressed; base of shell inflated; columella margin white,

thickened, almost vertically descending, bulging inwardly in the median part; labrum simple, receding below; aperture subovate.

Alt. 1.75, diam. maj. 3 mm.

Hab. Mount Pitt, Norfolk Island (*R. Bell*).

*Nitor retinaculum*, sp. n.

Shell small, depressedly conic, thin, transparent, somewhat shining, yellowish brown; whorls 4, regularly increasing, the last subangled at the periphery, sculptured only with rather closely set, oblique, arcuate plicæ, which are more noticeable on the later convolutions; suture impressed; columella margin curved above, very obliquely descending and thickened inwardly into a whitish loop-like lamella, visible through the test; labrum acute; aperture obliquely and compressedly sublunate.

Alt. 1.5 (nearly), diam. maj. 3, diam. min. 2.5 mm.

Hab. Ball's Bay, Norfolk Island (*R. Bell*).

MACGILLIVRAYELLA, gen. nov. (*Zonitidæ*).

Shell depressedly turbinate, small, vitreous, somewhat broadly perforate.

Genotype: *M. crystallina*, Preston.

*Macgillivrayella crystallina*, sp. n.

Shell small, depressed, orbicular, white, semitransparent; whorls  $3\frac{1}{2}$ , sculptured with rather fine, somewhat closely set, oblique, arcuate striæ, which become obsolete on the base of the shell; suture deeply impressed; umbilicus wide, moderately deep; columella margin descending in a curve; labrum acute, receding below; aperture roundly sublunate.

Alt. 1, diam. maj. 2.5, diam. min. 2.25 mm.

Hab. Norfolk Island.

JOHANNESOCONCHA, gen. nov. (*Zonitidæ*).

Shell minute, vitreous, turbinate, multispiral, umbilicate.

Genotype: *J. multivolva*, Preston.

*Johannesconcha multivolva*, sp. n.

Shell minute, turbinate, thin, white, polished, shining; whorls 5, rather rapidly increasing, the last scarcely ascending in front, faintly marked with lines of growth; base of shell



radiately striate; suture well impressed; umbilicus moderately wide, deep, well-like; labrum simple; aperture obliquely sublunate.

Alt. 5, diam. maj. 1.25 mm.

*Hab.* Norfolk Island, under dead leaves (*Macgillivray*, June 1855).

*Johannesconcha pusillior*, sp. n.

Shell differing from *J. multivolva* in its smaller size, more depressed form, and less well-like umbilicus, the margin of which is much less abrupt.

Alt. .25, diam. maj. 1.25 (nearly) mm.

*Hab.* Norfolk Island.

*Johannesconcha minuscula*, sp. n.

Shell very minute, depressedly turbinate, in subfossil condition white; whorls  $3\frac{1}{2}$ , regularly increasing, marked only with faint transverse growth-striæ; suture impressed; umbilicus moderately narrow, deep, well-like; columella margin obliquely descending; labrum acute; aperture very broadly and depressedly subrescentic.

Alt. .25, diam. maj. 1 mm.

*Hab.* Limestone Quarry, S.E. coast of Norfolk Island, where it occurs in a subfossil state (*R. Bell*).

*Charopa mathewsi*, sp. n.

Shell small, orbicular, planulate above, widely umbilicate below, chestnut-coloured throughout; whorls  $4\frac{1}{2}$ , regularly, but rather slowly, increasing, the last descending, the embryonic whorls smooth, the remainder sculptured with regular, radiate, rounded costulæ, the interstices being occupied by fine, closely set, transverse striæ crossed by very fine and indistinct spirals; columella margin slightly reflexed above, obliquely descending; labrum simple; aperture obliquely subquadrate.

Alt. .75, diam. maj. 2.5, diam. min. 2.25 mm.

*Hab.* Ball's Bay, Norfolk Island (*R. Bell*).

*Charopa sororcula*, sp. n.

Shell allied to *C. mathewsi*, but lighter in colour, being of a yellowish-brown tint; it is also much smaller, though having the same number of whorls, the sculpture is finer, though similar in other respects, the apex is slightly exserted, the last whorl does not descend, and the aperture is narrowly

ovate, having the appearance of being laterally compressed, while in *C. mathewsi* it is compressed above and laterally dilated.

Alt. .5, diam. maj. 1.5 mm.

*Hab.* Mount Pitt, Norfolk Island (*R. Bell*).

CRYPTOCHAROPA, gen. nov. (*Endodontidæ*).

Shell planulate, incrustated with an agglutinated mass of earth and vegetable matter, which broadens out at the periphery into a serrated fringe.

Genotype: *C. atlantoididea*, Preston.

The agglutinated covering which is present in every individual seen by the author, and which is extremely hard to remove even after several days of soaking, would seem to be a habitual generic character. The shell has a superficial resemblance to *Charopa*, though probably having no close relationship with that genus.

*Cryptocharopa atlantoididea*, sp. n.

Shell of moderate size, very depressedly orbicular, almost planulate above, covered with an agglutinated mass of foreign matter which broadens at the periphery into a coarse saw-like fringe or projection, and beneath which the shell is of a reddish-brown colour; whorls 5, regularly increasing, the last strongly angled at the periphery, sculptured with coarse, irregular, somewhat radiate, transverse, and rather distant, wavy, spiral striæ, the latter becoming obsolete on the base of the shell; suture deeply impressed; umbilicus very wide; columella margin excavatedly angled above, obliquely curved below; labrum simple, receding below, projecting in front; aperture subcircular.

Alt. 1.5, diam. maj. 3.75, diam. min. 3.25 mm.

Aperture: alt. 1.25 (nearly), diam. 1.25 (nearly) mm.

*Hab.* Mount Pitt, Norfolk Island (*R. Bell*).

The above measurements were taken after the agglutinated foreign matter had been removed from the shell.

*Paralaoma orestias*, sp. n.

Shell rather small, turrlinate, somewhat shining, pale yellowish brown flecked with blotches of white; whorls 5, the last subangulate at the periphery and descending in front, sculptured, especially on the lower whorls, with arcuate, slightly distant, transverse costulæ; suture impressed;

umbilicus moderately narrow, deep; columella margin outwardly reflexed, descending in a curve, diffused above it into a parietal callus which reaches to the upper margin of the labrum; labrum having the extreme edge submembranaceous; aperture ovate.

Alt. 1, diam. maj. 2·25, diam. min. 2 mm.

*Hab.* Mount Pitt, Norfolk Island (*R. Bell*).

*Paralaoma perminuta*, sp. n.

Shell minute, depressedly turbate, thin, horny, pale brownish yellow; whorls 4, regularly increasing, sculptured with somewhat obsolete, transverse, arcuate plicæ; suture impressed; base of shell not very convex, sculptured with slightly wavy and closely set, punctate, revolving striæ; umbilicus moderately wide; columella margin obliquely descending; labrum simple; aperture compressedly sub-lunate.

Alt. ·25, diam. maj. 1·25 (nearly) mm.

*Hab.* Mount Pitt, Norfolk Island (*R. Bell*).

*Paralaoma depressior*, sp. n.

Shell allied to *P. perminuta*, but considerably larger and having an additional half whorl; the last whorl is considerably flattened above and strongly angled at the periphery, the colour is darker, being in the present species of a dark brownish-amber shade; the columella margin descends almost vertically and the aperture, though somewhat compressed towards the base, is obliquely subovate; the system of sculpture is altogether that of *P. perminuta*.

Alt. ·75, diam. maj. 2·25, diam. min. 2 (nearly) mm.

*Hab.* Mount Pitt, Norfolk Island, in several localities (*R. Bell*).

NORFOLCIOCONCHA, gen. nov. (*Endodontidæ*).

Shell minute, subhyaline, turbate, with open umbilicus, sculptured with transverse riblets; aperture armed with two parietal lamellæ and two lamellæ on the outer wall.

Genotype: *Endodonta norfolkensis*, Hedley \*.

*Norfolcioconcha iota*, sp. n.

Shell very minute, depressedly turbate, in subfossil

\* Rec. Austr. Mus., Sydney, vol. iii. p. 152, pl. xxviii. figs. 4, 5, 6.

condition white, vitreous, shining; whorls 4, regularly increasing, radiately finely costulate; suture impressed; base of shell sculptured with revolving striæ; umbilicus narrow, deep, well-like; columella margin obliquely descending; aperture somewhat compressedly sublunate, armed with four erect plaits, of which two are on the parietal wall, one below the other, and two on the outer wall, similarly situated.

Alt. .25, diam. maj. 1 mm.

*Hab.* Limestone Quarry, S.E. coast of Norfolk Island, where it occurs in a subfossil state (*R. Bell*).

*Succinea humerosa*, sp. n.

Shell allied to *S. norfolkensis*, Sykes \*, but differing from that species in being rather narrower in form and in having the last two whorls conspicuously *shouldered above and below*; the aperture is also rather longer and narrower than in *S. norfolkensis*.

Alt. 13.5, diam. maj. 8.5, diam. min. 5 mm.

Aperture: alt. 8, diam. 5 mm.

*Hab.* Nepean Island, in a subfossil state only.

*Succinea nepeanensis*, sp. n.

Shell elongate, whorls 3, rapidly increasing, moderately convex, the last very long; suture well impressed; columella margin curved, narrowly calloused; labrum simple, somewhat bent inwards over the aperture above; aperture ovate.

Alt. 14.75, diam. maj. 7.25, diam. min. 5.5 mm.

Aperture: alt. 9.25, diam. 5.75 mm.

*Hab.* Nepean Island, in a subfossil condition only (*R. Bell*).

*Tornatellina norfolkensis*, sp. n.

Shell subulately cylindrical, thin, fragile, semitransparent, smooth, polished, shining, pale reddish brown; whorls 6, the first very small, the second proportionately large, the remainder regularly increasing, marked only with irregular growth-plicæ; suture impressed, very narrowly margined below, columella whitish, developed into a rather twisted, inwardly projecting fold, and extending above into a light, well-defined, and somewhat restricted parietal callus, which reaches to the upper margin of the labrum; labrum simple; aperture inversely auriform, bearing a single, curved, erect, white, entering, parietal lamella.

Alt. 3.5, diam. maj. 1.25 mm.

*Hab.* Ball's Bay, Norfolk Island (*R. Bell*).

\* Proc. Malac. Soc. London, iv. 1900, p. 144, pl. xiii. fig. 12.



*Tornatellina norfolkensis moohuensis*, subsp. n.

Shell differing from *T. norfolkensis*, Preston, in its very slightly shorter and *much broader* form, and in the parietal lamella, which, in the present species, is quite obsolete.

Alt. 3·5, diam. maj. 1·5 mm.

*Hab.* Moohu Stone, a small islet off the coast of Norfolk Island (*R. Bell*).

*Tornatellina norfolkensis nepeanensis*, subsp. n.

Shell allied to both *T. norfolkensis* and *T. moohuensis*, but differing from the former in its much broader form and from the latter in its more tapering spire, more rounded whorls, and well-developed parietal lamella.

Alt. 3·5, diam. maj. 1·5 mm.

*Hab.* Nepean Island (*R. Bell*).

With the exception of *Vallonia* sp., which is exceedingly plentiful, this and the following are the only living species of land-mollusca found upon the island.

*Tornatellina duplicilamellata*, sp. n.

Shell fusiformly ovate, polished, shining, yellowish brown; whorls 5, regularly but rather rapidly increasing, somewhat inflated, marked only with growth-striae; suture impressed; columella margin white, twisted, bearing a short projecting lamella above, descending below in an almost vertical curve; aperture rather obliquely inversely auriform, furnished with a well-developed, entering, parietal lamella.

Alt. 2·25, diam. maj. 1·5 (nearly) mm.

*Hab.* Nepean Island (*R. Bell*).

*Palaina norfolkensis*, sp. n.

Shell moderately small, sinistral, fusiformly ovate; colour of type-specimen pale yellowish, but varying in individuals from pure white to yellowish and delicate flesh-colour; whorls 6, convex, the first two small, the third large in proportion, the remainder regularly increasing, the apical whorl quite smooth, the second showing signs of very oblique, obsolete, transverse ribbing, the third finely and rather closely costulate; the fourth and remainder beautifully sculptured with slightly distant and oblique, erect, transverse, blade-like costulae, the interstices on all four last whorls sculptured with fine, closely set, wavy, spiral striae; suture deeply impressed; umbilicus very narrow; labrum con-

tinuous, vitreous, showing under the microscope the concentric growth-markings, broadly expanded except in the parietal region, where it is considerably contracted, not reflexed, circumference ovate; aperture circular, set well to the left of the axis of the shell; operculum thin, corneous, yellowish white, paucispiral, with central raised nucleus.

Alt. 2·5, diam. maj. 1·25 mm.

*Hab.* Stockyard Creek, Norfolk Island (*R. Bell*).

*Palaina belli*, sp. n.

Shell small, sinistral, roughly ovate, dull white shading to pale flesh-colour, with reddish-brown apex; whorls 5, convex, the first two small, the third proportionately large, the remainder regularly increasing, the two apical whorls quite smooth, the remainder sculptured with closely set, wavy, spiral striæ which become considerably coarser on the last whorl, crossed by not very erect, rather oblique, transverse costulæ; suture deeply impressed; umbilicus narrow, deep; labrum continuous, outwardly expanded, sublaminiferous, circular; aperture large for the size of the shell, subcircular.

Alt. 3·5, diam. maj. 1·75 (nearly) mm.

*Hab.* Mount Pitt, Norfolk Island (*R. Bell*).

Differing from the preceding chiefly in its smaller size, it having one whorl less, in the more closely set and less erect and blade-like costulæ, coarser spiral striæ, the circular circumference of the labrum, and in the comparatively large size and more central position of the aperture with regard to the axis of the shell.

LXVI.—*Five new Siphonaptera from Asiatic Russia, collected by W. Rückbeil.* By the Hon. N. CHARLES ROTHSCHILD, M.A.

[Plates XIV. & XV.]

ONE of the two species described below belongs to the genus which we call *Ctenophthalmus*, Kolen. We dealt with this generic name at some length in Nov. Zool. 1911, p. 80, and came to the conclusion that its type is a species with three genal spines. A. C. Oudemans, in a recent note on Siphonaptera (Entom. Berichten, 1913, p. 341), maintains, on the contrary, that *musculi* is the type. He says:—"The genus *Ctenophthalmus* is well defined by Kolenati by the words

‘hat vor den Ocellen kleine bewegliche Ctenidien.’” The only European species of flea, Oudemans continues, which conforms to this definition is *musculi*, Dugès. Oudemans, it will be noticed, identifies (without further consideration) the “movable ctenidia” mentioned by Kolenati with the spine-like frontal bristles found in *musculi* and allies, *i. e.* in the genus which we call *Leptopsylla*. These frontal bristles, however, are by no means the ctenidia of Kolenati’s description of *Ctenophthalmus*. The list of species which Kolenati gives as belonging to *Ctenophthalmus* proves that the “movable ctenidia in front of the ocelli” are nothing else but the genal ctenidia, which are present in all the species Kolenati mentions, while the frontal spiniform bristles are found only in the one species to which he refers as *talpæ*. Moreover, the whole context shows clearly that *Ctenophthalmus* was meant to comprise all the species with pronotal and genal combs. It was, in fact, a composite genus with a very general definition, and without any fixation of a type. We go even further, maintaining that Kolenati did not know of the existence of the spiniform frontal bristles of *musculi*, Dugès. He does not mention them anywhere, nor are they indicated in the figure which he gives of *musculi* (1863). We consider, therefore, Oudemans’ action as being based on an erroneous premise, and shall continue to use, as did Kolenati in his later papers, the name *Ctenophthalmus* for *bisocotodentatus* and allies.

It may be mentioned in passing that Oudemans is also in error when stating that *musculi* is the only European species with “movable ctenidia in front of the eyes” in Oudemans’ sense. There are several such species in Europe, one of which (*bidentatus*, Kolen., = *monoctenus*, Kolen., = *sobrinus*, Roths.) was already known to Kolenati besides *musculi*.

### 1. *Ctenophthalmus dolichus*, sp. n.

(Pl. XIV. figs. 1, 2.)

♂ ♀.—A near ally of *Ct. caucasica*, Taseh. (1880), but at once distinguished by the longer bristles of the hind tarsus and by the modified abdominal segments.

The pronotal comb contains fourteen spines. The longest apical bristle of the hind tibia extends to the apex of the first tarsal segment or beyond, the corresponding bristle of this segment reaching to the apex of the second segment, and the second segment has three apical bristles extending beyond the apex of the fourth. Several of the other bristles

of the hind tibia and hind tarsus also are longer than in *Ct. caucasica*.

The clasper (Cl) of the ♂ (fig. 1) is produced distally into a very long and straight process, P<sup>2</sup>, which is longer than in any of the allied species. The dorsal apical angle of the clasper is rounded (P<sup>1</sup>) and bears three long bristles and several small ones. The movable exopodite F is as large as in *Ct. caucasica*. Its ventral margin is distally somewhat concave. The ninth sternite (ix.st.) is less obtuse and bears more bristles than in *Ct. caucasica*. The seventh sternite of the ♀ (Pl. XIV. fig. 2, vii.st.) is bisinuate, the lower sinus being very shallow. The apex of the segment is divided by these excisions into three lobes, the ventral lobe hardly at all projecting, the second one being broad, short, and strongly rounded, and the third much narrower and longer than the second. The ventral row of bristles of the eighth sternite (viii.st.) ends with one short stout bristle.

A small series of both sexes from near Djarkent, Semitehenskoi, East Turkestan, November 25th and December 5th, 1912, off *Meriones tamaricinus*.

## 2. *Neopsylla teratura*, sp. n. (Pl. XIV. fig. 3.)

♂ ♀.—A very near relative of *N. bidentatiformis*, Wagn. (1893). The pronotum, in the ♂, bears on each side only 1 or 2 bristles in front of the postmedian row, and in the ♀ 4 or 5, instead of a more or less complete second row.

The eighth sternite of the ♂ has an apical brush of bristles, the long bristles being of nearly even width from the base to near the apex. The clasper (Cl) closely resembles that of *N. bidentatiformis*, but the process P<sup>2</sup> (fig. 3), as well as the movable process F, are narrower. The ninth sternite (ix.st.) has a very characteristic armature. The horizontal arm bears distally two rows of stout, short, spine-like bristles. One row is ventral and placed on the outer side, the other being situated along the centre of the inner surface. The ventral spines are strongly curved inwards and backwards, particularly the proximal ones. In *bidentatiformis*, of which Professor Wagner has kindly given us a ♂, there is only one row of spines, placed at the ventral margin, the spines being almost straight (fig. 4). The manubrium (M) of *teratura* is straight, with the extreme tip turned upwards. In the ♀ the apical margin of the seventh sternite is very slightly incurved, with the upper angle distinct but rounded. The eighth tergite bears a submarginal row of 8 bristles, the row being sometimes continued proximally by some small



bristles. Proximally to the row there are 7 to 12 bristles, and on the inner surface at and near the margin 9 to 12.

1 ♂ and 2 ♀ ♀ from near Djarkent, Semitchenskoi, East Turkestan, February 11th and 19th, 1912, off a white weasel and *Meriones tamaricinus*.

I am not convinced that Wagner was correct in sinking his *setosa* as a synonym of *bidentatiformis* (cf. Hore Soc. Ent. Ross. vol. xxxvi. p. 143, 1902). The original specimens of *bidentatiformis*, Wagn. (1893), were found by Wagner in the Crimea on *Epimys decumanus*, the above-mentioned ♂ being one of these specimens. This example bears on the pronotum on each side a postmedian row of 8 long bristles, in front of this row another of 8 smaller ones, and dorsally some additional small bristles representing a third row. We figure the ninth sternite of this true *bidentatiformis* (fig. 4). A ♀, also received from Professor Wagner, obtained in the Northern Caucasus off *Spermophilus*, and identified by him as the same species, has a shorter pronotum, which, moreover, bears only one row of bristles, the second (anterior) row being only represented by a few pale dots, which are presumably the grooves of insertion of small hairs. The individual otherwise agrees fairly well with the ♀ ♀ described above as *teratura*. As Wagner states of *bidentatiformis*, as well as *setosa*, that the pronotum has only one row of bristles (6 on each side), and as the specimens subsequently identified by him as *bidentatiformis* came from different countries and hosts, a re-examination of the types appears advisable. Possibly *setosa* is the same as *teratura*.

In Proc. Zool. Soc. Lond. 1911, p. 387, we described as *Neopsylla compar* another species closely allied to *N. bidentatiformis*. In this species, however, the small hairs found in *bidentatiformis* and *teratura* on the inner surface of the hind coxa are, partly, replaced by short spines. The ♀ ♀ of *teratura* and *compar*, as well as the above-mentioned ♀ received from Wagner as *bidentatiformis*, do not exhibit any very striking differences in the seventh and eighth abdominal segments and the receptaculum seminis (cf. Proc. Zool. Soc. Lond. 1911, p. 387, text-fig. 120).

### 3. *Ceratophyllus curvispinus*, Miyaj. (1912).

*Paradoxopsyllus curvispinus*, Miyajima, ubi?

*Ceratophyllus subcavatus*, Rothschild, in Clark and Sowerby. Through Shen-Kan, p. 194, no. 1, text-figs. 1, 2 (1912).

The author of *curvispinus* has very kindly sent several examples of this species, which proves to be the same as my

*subcæcatus*. The description of *subcæcatus* was already printed when the specimens of *curvispinus* arrived, but the book in which the description appeared was only issued in the second half of 1912.

Although *curvispinus* is very remarkable on account of the peculiar development of the ninth abdominal sternite of the ♂, the species fits very well into *Ceratophyllus* as at present composed. If the genus *Ceratophyllus*, however, should require dividing up into a number of separate genera, *Paradoxopsyllus* will probably be one of them.

The two following species are so similar to *curvispinus* that a lengthy description is not necessary:—

4. *Ceratophyllus teretifrons*, sp. n. (Pl. XV. fig. 5.)

♂ ♀.—The frons has no tubercle in either sex, whereas a distinct frontal tubercle is present in both *curvispinus* and in the new species described under no. 5. There are two rows of bristles on the frons, the anterior row containing in the ♂ 5 or 6 and in the ♀ 4 or 5 bristles, the second row 3 large bristles in both ♂ and ♀. The occiput bears 2 or 3 bristles above the centre of the antennal groove, and in the ♂ 10 or more small hairs along the antennal groove. The long apical dorsal and ventral bristles of the hind tibia reach to the apex of the first tarsal segment, and the second segment has in both sexes two apical bristles extending beyond the fourth segment, these bristles being particularly long in the ♂. In the ♂ of *curvispinus* a subapical dorsal bristle of the second hind-tarsal segment also is much prolonged, which is not the case in *C. teretifrons*. The first mid-tarsal segment is at least one-eighth longer than the second.

In the ♂ of *teretifrons* (fig. 5) the eighth abdominal tergite only bears four long bristles, there being no patch of bristles on the sides, and the eighth sternite has on each side 3 or 4 bristles. The apical process P of the clasper is triangular, not truncate. The movable process F is longer than in *curvispinus*, its longest bristle being placed nearer the apex and its posterior edge bearing 6 to 8 thin hairs. The ninth sternite has the same peculiar shape as in *curvispinus*, but its ventral arm differs in being less abruptly widened in the centre and having here two slender bristles proximally to the two long ones, instead of their being short and spiniform. The apical hook of the penis is shorter and less slender than in *curvispinus*.

The modified abdominal segments of the ♀ do not present any reliable difference from the allied species, the outline and bristles of the eighth tergite being individually variable.

A series of both sexes from near Djarkent, Semitchenskoi, East Turkestan, October 15th and November 15th, 1912, off *Meriones tamaricinus*.

5. *Ceratophyllus repandus*, sp. n. (Pl. XV. figs. 6, 9.)

♂ ♀.—The frons has in both sexes a distinct tubercle. The bristles of the head and legs are similar to those of *C. teretifrons*, but the anterior row of the frons contains one or two bristles less.

The clasper resembles that of *teretifrons*, but the finger is a little shorter and bears fewer bristles at the posterior margin, the interspace between the longest bristle and the next below it being wider than in *teretifrons*. The widened central portion of the ventral arm of the ninth sternite (fig. 6) is more gradually dilated, and the bristles it bears are much less prolonged. There are in this place four bristles, the first being the shortest and thinnest and the other gradually increasing in length. The ventral angle of the dilated apex of this segment is rounded, and not triangular as in the two preceding species, and the apical hook of the penis is much broader, shorter, and more obtuse than in *curvispinus* and *teretifrons*.

The seventh and eighth abdominal segments of the ♀ (fig. 9) are apparently indistinguishable from those of *teretifrons*. The stylet, however, is half as long again in *teretifrons* as in *repandus*, being in *teretifrons* as long as the fourth hind-tarsal segment.

A series of both sexes from near Djarkent, Semitchenskoi, East Turkestan, October 5th, 1912, off *Meriones tamaricinus*.

6. *Ceratophyllus consors*, sp. n. (Pl. XV. figs. 7, 8.)

♂ ♀.—A near ally of *C. henleyi*, Roths. (1904), and *maurus*, Jord. & Roths. (1912), the apical bristles of the hind-tarsal segments being long and the dorsal ones of the meso- and metanota and proximal abdominal tergites forming in the ♂ a kind of mane. Two of the apical bristles of the second segment of the hind tarsus extend considerably beyond the apex of the fourth segment, being somewhat longer than in *henleyi* and *maurus*. *C. consors*, however, is more easily differentiated by the modified abdominal segments.

In the ♂ the eighth abdominal tergite (Pl. XV. fig. 7.

viii.t.) bears many more bristles than in the allied species, and is also more strongly produced posteriorly. In the clasper and its two processes, P and F, *C. consors* agrees rather closely with *C. henleyi*; but P is broader in *consors*, and the proximal edge of F is not angulate. The ninth sternite (ix.st.), however, is decidedly narrower distally than in *C. henleyi*. The seventh sternite of the ♀ (Pl. XV. fig. 8) is obliquely sinuate, the lobe below the sinus being much produced and rounded, except ventrally, while the lobe above the sinus is usually narrow and pointed. This upper lobe varies greatly in length, being sometimes very short and rounded.

A long series of both sexes from Djarkent, Semitchenskoi, East Turkestan, October 15th, 1912, off *Meriones tamaricinus*.

#### EXPLANATION OF THE PLATES.

##### PLATE XIV.

- Fig. 1.* Clasper-organs of ♂ of *Ctenophthalmus dolichus*, sp. n. Cl, clasper; P<sup>1</sup> and P<sup>2</sup>, upper and lower processes of same; F, movable process; viii.st. and ix.st., eighth and ninth sternites.  
*Fig. 2.* Seventh and eighth abdominal segments of ♀ of *Ctenophthalmus dolichus*.  
*Fig. 3.* Clasper-organs of ♂ of *Neopsylla teratura*, sp. n.  
*Fig. 4.* Ventral arm of ninth sternite of ♂ of *Neopsylla bidentatiformis*, Wagn. (1893).

##### PLATE XV.

- Fig. 5.* Clasper-organs of ♂ of *Ceratophyllus teretifrons*, sp. n.  
*Fig. 6.* Ninth sternite and apex of penis of ♂ of *Ceratophyllus repandus*, sp. n.  
*Fig. 7.* Clasper-organs of ♂ of *Ceratophyllus consors*, sp. n.  
*Fig. 8.* Seventh and eighth abdominal segments of ♀ of *Ceratophyllus consors*, sp. n.  
*Fig. 9.* Seventh and eighth abdominal segments of ♀ of *Ceratophyllus repandus*, sp. n.

LXVII.—*Notes on the South-American Freshwater Flying-fish, Gastroleucus, and the common Flying-fish, Exocoetus.*  
 By W. G. RIDEWOOD.

[Plate XVI.]

ALTHOUGH less popularly known than the common flying-fish, *Exocoetus*, the flying gurnard, *Dactylopterus*, and the African freshwater flying-fish, *Pantodon*, the freshwater flying-fish of Guiana, *Gastroleucus*, may ultimately prove to have a better



claim to the title "flying-fish" than the others, for there is no doubt in their case that the pectoral fins are flapped vigorously during the passage of the fish through the air. The various species of *Gastropolecus* possess a deep, laterally compressed body, with fairly long and curved, but not remarkably large, pectoral fins. The length of the fish is some 3 inches or less. The habits of these fishes are alluded to in Mr. and Mrs. Beebe's book 'Our Search for a Wilderness' (London, 1910), and the species and their habits are described by C. H. Eigenmann ("Freshwater Fishes of British Guiana," Memoirs of the Carnegie Museum, v., Pittsburg, 1912, p. 47). The fishes are said to dart forward for a distance of 40 feet or more, beating the water with their pectoral fins, the upper part of the body alone being exposed, and the sharp keel of the breast acting as a cut-water. They then leave the water entirely for a distance of 5 or 10 feet, and, when exhausted, fall sideways into the water again.

Removal of the skin from the front half of the body displays the great pectoral muscle, which is one of the most striking features of the fish. This muscle is in the form of a thick sheet, thinning off at the front and lower edges. The muscle-fibres radiate in an upward direction from the front and lower edges to the base of the pectoral fin, to the underside of the fin-rays of which their tendinous extremities are attached. This great muscle, by its contraction, draws down the fin. The elevator muscles of the fin are small, no larger than would be the case in an ordinary fish of the same size.

The great external pectoral muscle arises from the whole of the side of a large keel or plate of bone lying in the median plane of the body; the plate is corrugated in a radiating manner, like a half-opened fan (see Plate XVI.), the radiating ridges of one side corresponding with the radiating grooves of the other side. This corrugation of the lamina of bone affords greater strength, and offers a larger surface for the attachment of the muscle, than would be the case if it were flat. The front edge of the keel reaches the surface of the body, and is covered by thin skin only; it forms the edge of the "cut-water." The pectoral girdle of *Gastropolecus* has already been figured by C. T. Regan (Ann. & Mag. Nat. Hist. (8) viii., July 1911, p. 19), but when dissociated from the rest of the skeleton its relatively great size is not apparent (see Plate XVI.).

The great keel is composed of the coalesced right and left coracoid (hypocoracoid) bones; the upper front point of it

is connected by ligament with the anterior ends of the clavicles. The nearest allies to *Gastrolepecus* are most probably the species of *Tetragonopterus*, of the family Characidae. In *Tetragonopterus*, however, there is nothing unusual about the pectoral girdle; the downwardly directed plates of the coracoids extend in close contact with one another for some little distance, as in many other Characidae (e. g., *Chalcinus trachypomus*; see Regan, Ann. & Mag. Nat. Hist. (8) viii. p. 19, fig. 1, B), but the plates are not fused into a single median lamina, and they exhibit no radiating grooves and ridges.

More remarkable than the great size of the bony keel of the pectoral girdle of *Gastrolepecus* is the high proportion which the weight of the muscles attached to the keel bears to the total weight of the body. Put roughly, the right and left external pectoral muscles together constitute one-fourth of the weight of the fish, whereas in the allied but unmodified form *Tetragonopterus* the proportion is 1 to 140. The details of the computation are as follows:—The weight of a specimen of *Gastrolepecus stellatus*, taken from spirit and lightly wiped with a cloth, was 6.50 grammes; the weight of the right and left external pectoral muscles dissected off was 1.59 grammes. The proportion of the latter to the former is 1 to 4.088. In the case of a specimen of *Tetragonopterus aeneus*, selected as nearly as possible of the same size as the specimen of *Gastrolepecus*, the total weight of the body was 7.01 grammes, the weight of the right and left external pectoral muscles was .050 gramme; the proportion of the latter to the former is thus 1 to 140.2.

So remarkable is this difference in the relative size of the depressor muscle of the pectoral fin in *Gastrolepecus* and *Tetragonopterus*, that it seemed advisable to compare by the same method the depressor muscles of the common flying-fish, *Exocoetus*, with those of its nearest relatives, e. g. the skippers, of the genus *Hemirhamphus*, for which no one has claimed the capacity for flight. The figures given by C. D. Durnford (Ann. & Mag. Nat. Hist. (7) xviii., Nov. 1906, p. 337) are computed from the depth to which a pin reaches when inserted into the muscle at certain points, and not by weighing the muscle dissected from the body.

There is nothing in the appearance of the bones of the pectoral girdle of *Exocoetus* and *Hemirhamphus* to suggest that the muscles are vastly greater in the former than in the latter; the proportions of the parts are much the same in both, and there is not in either case a great keel or median lamina of bone for the attachment of the depressor muscles.

For the purpose of this comparison spirit-preserved specimens of *Exocætus evolans* and *Hemirhamphus roberti* were taken, of as nearly the same size as was possible. *Hemirhamphus* is a more slender fish than *Exocætus*, the lower lobe of its caudal fin is only slightly larger than the upper lobe, and the lower jaw is greatly produced beyond the upper jaw. For comparing the lengths of the two fishes, therefore, it is better to disregard the lower jaw and the tail-fin, and to measure from the front of the upper jaw to the end of the scaly part of the base of the tail. This measurement in the case of *Exocætus* was 151 mm.; in *Hemirhamphus* it was 185 mm. The length of the pectoral fin lying closed against the side of the body was 106 mm. in *Exocætus*; in *Hemirhamphus* it was 23 mm. The girth of the middle part of the body was 81 mm. in *Exocætus* and 71 mm. in *Hemirhamphus*. In the case of *Exocætus* the weight of the body was 46·5 grammes, the weight of the right and left external pectoral muscles ·78 gramme, and the proportion yielded was 1 to 59·61. In the case of *Hemirhamphus* the body-weight was 39·0 grammes, the weight of the external pectoral muscles ·32 gramme, and the proportion was 1 to 121·87. Or, putting it the other way, the body-weight in each case being unity, the pectoral muscle-weight is ·0167 of the body-weight in *Exocætus* and ·0082 in *Hemirhamphus*. In other words, the muscles are twice as large in *Exocætus* as in a *Hemirhamphus* of about the same size.

That the pectoral fins of *Exocætus* are larger than in most fishes of the same size is admitted by all, even by those who contend that the fish does not fly, *i. e.* flap its fins, but merely uses the fins for gliding or "planing" when once the vigorous lashing of the tail has jerked the body obliquely into the air. With an enlargement of the fin-area one would naturally expect an enlargement of the muscles that operate the fins. The point to be solved is whether the muscles have been enlarged in the same proportion as the fin-area, or whether they have been enlarged in a much greater proportion, as would be necessary if the fish is to flap the fins so vigorously as to maintain the body in the air, as is claimed by the adherents of the "flying" hypothesis.

For the determination of this point the left pectoral fin of each fish was spread out on a sheet of paper, a pencil line was drawn around the edge, and the paper was then cut along the pencil line. A strip of the same sheet of paper was cut 1 centimetre wide, and this strip was shortened successively until it weighed the same as the piece of paper

representing the fin. The length of the strip of paper in centimetres gives, with approximate accuracy, the size of the fin-surface in square centimetres. The sizes so obtained are probably too small, for it is not possible to spread out to its fullest extent the fin of a fish that has been preserved in alcohol. The surface of the two pectoral fins of *Exocoetus* as thus computed was 38.4 square centimetres, whereas the corresponding area in the case of *Hemirhamphus* was 3.9 square centimetres. That is to say, the superficial area of the pectoral fins of *Exocoetus* is some eight or nine times that of the corresponding surface in a *Hemirhamphus* of the same size, whereas the weight of the external pectoral muscles is only twice.

As an item of negative evidence, it may be of interest to state that a microscopical examination was made of dissociated fibres of the external pectoral muscles of *Gastropolecus stellatus*, *Tetragonopterus aeneus*, *Exocoetus evolans*, and *Hemirhamphus roberti*, in order to ascertain if in the "flying" form the cross-stripping of the muscle-fibres was more pronounced than in the control species. The fibres, after being teased, were stained, some with picric-acid-fuchsin (van Gieson's stain), some with borax-carmin; some were examined in diluted glycerine, some in Canada balsam. Examination of these slides failed to show any marked differences in the degree of cross-stripping.

In conclusion, I have to thank Dr. S. F. Harmer, F.R.S., Keeper of the Department of Zoology in the British Museum, and Mr. C. Tate Regan, M.A., Assistant in charge of the Fishes, for providing me with the specimens upon which the observations recorded above were made.

#### EXPLANATION OF PLATE XVI.

Photograph of a skeleton of *Gastropolecus stellatus* ( $\times \frac{3}{2}$ ). Note the great radially corrugated keel of bone, to the right and left sides of which are attached the external pectoral muscles, which pull down the fins.

LXVIII.—*Phallostethus dunckeri*, a remarkable new  
*Cyprinodont Fish from Johore.* By C. TATE REGAN, M.A.

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IN 1904 (Mitteil. Naturhistorisch. Mus. Hamburg, xxi. pp. 135-207) Dr. G. Duncker published a memoir on the Fishes of the Malay Peninsula, and on page 171 mentioned



a new Cyprinodont in the following words:—"Die beschreibung zweier weiterer, einer neuen Gattung mit gekieltem Abdomen, hinter der A. befindlicher D., gegabelter C. und fehlenden V. angehörigen Arten dieser Familie behalte Ich für später vor. Beide gehören dem Brackwasser an (Kuala Langat, Muar-Flusz bei Bandar Maharani)."

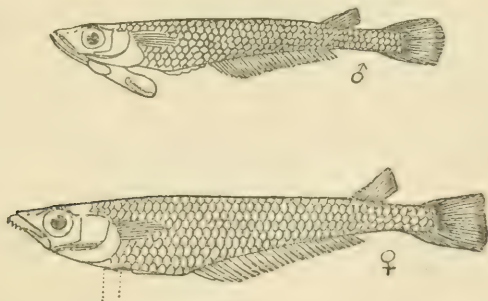
A few months ago Dr. Duncker visited the British Museum to study our Syngnathidae, and I then asked him whether he had published anything further concerning these fishes, whereon he kindly offered to send me some of them for description, as he was engaged in other work.

The specimens prove to belong to a new genus and species, which is so different from other known Cyprinodonts that it should perhaps rank as the type of a separate subfamily.

### PHALLOSTETHUS, gen. nov.

Form elongate, compressed; scales moderate; vent thoracic. Mouth protractile, oblique, with the horseshoe-shaped lower jaw included within the shovel-shaped upper one; teeth conical, biserial; outer series of upper jaw curved, rather strong, especially the anterior lateral ones; outer series of lower jaw nearly horizontal. Dorsal fin short,

Fig. 1.



*Phallostethus dunckeri*, male and female, a little more than twice natural size.

originating above end of the long anal; in front of the latter a median dermal fold placed in a groove. Female with pelvic fins minute, below the pectorals, between vent and opening of oviduct. Male with a large muscular appendage attached between the expanded hypocoracoids and free distally, bearing the vent on one side at about the middle of its

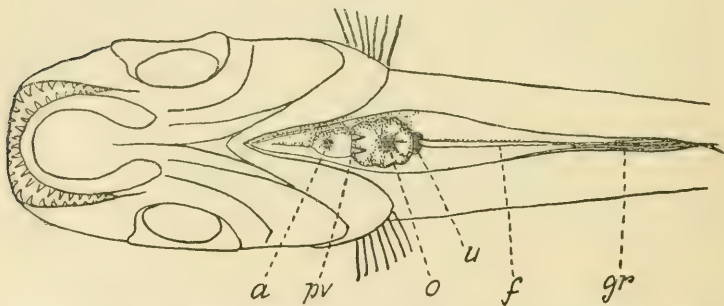
length and the genital opening at its posterior end, just behind the articulation of an external movable, forwardly directed, serrated bone; anteriorly the appendage ends in a long slender bone extending forwards to beneath the chin, curved towards the side on which the serrated bone lies and away from that on which the vent opens.

*Phallostethus dunckeri*, sp. n.

The form and proportions are shown by the accompanying figures. I count 8 to 10 dorsal and 26 to 28 anal rays; the caudal fin is imperfect in all, so that its exact shape is uncertain; there are about 40 scales in a longitudinal series, and they appear to correspond to the myotomes, so that the vertebræ number about 40. Of seven specimens (three males and four females) the largest male measures 25 mm., the largest female 29 mm. in total length.

The external features of the lower surface of the head and abdomen in the female fish are illustrated in fig. 2. A flattish

Fig. 2.



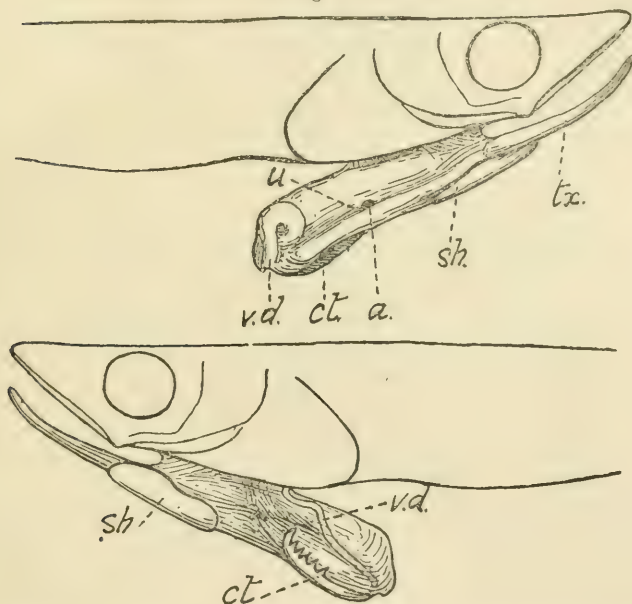
*Phallostethus dunckeri*, head and abdomen of female from below ( $\times 8$ ).

*a.*, anus; *pv.*, pelvic fin; *o.*, opening of oviduct; *u.*, urinary opening; *f.*, dermal fringe; *gr.*, groove.

median naked area margined anteriorly by the lower edges of the hypocoracoids expands backwards and contains successively the vent, a pair of almost vestigial pelvic fins, the genital and urinary apertures; from the last a low median keel runs backwards. Behind the opening of the oviduct the naked area contracts, and it becomes a groove, which extends to the origin of the anal fin, becoming narrower and deeper posteriorly; the walls of the groove are supported by the ends of the seven pairs of ribs.

The male (fig. 3) differs from the female externally in that the median keel is more developed as a membranous fringe and in front of it the very deep groove extends forwards, being margined anteriorly by the strongly expanded hypocoracoids, from between which there projects downwards and backwards a large fleshy appendage, oblong in form and laterally compressed, which may be termed the *priapium*; at the posterior end of this can be seen the opening of the vas deferens, and at about the middle of its length, on one side, hereafter termed the "proctal" side, the vent, directly behind which is the urinary opening. At the anterior end is a long and

Fig. 3.



*Phallostethus dunckeri*, male, showing external features of the priapium from the proctal and the aproctal side ( $\times 8$ ).

*tr.*, toxactinium; *ct.*, ctenactinium; *sh.*, shield of thick skin; *v.d.*, vas deferens; *a.*, anus; *u.*, opening of ureter. The two last lie in a slight groove which indicates the boundary between the dorsal and ventral muscles.

slender bony spine, rounded in cross-section, tapering forward beneath the chin, and curved away from the proctal side; this rod may be termed the *toxactinium*; it can be moved

laterally or downwards to a certain extent; its articulation with the priapium is covered by a large rounded shield of thick skin, placed ventrally, but much more developed upwards on the aoproctal side. At the posterior end just below the genital opening is articulated another bony spine, which seems to be freely movable outwards and may be termed the *ctenactinium*; when at rest this is directed forwards and lies on the aoproctal side of the priapium; it is laterally compressed, is straight, with the distal end somewhat curved upwards and ending in a pointed denticulation, and it bears five other somewhat smaller denticulations on its upper edge.

The skeleton seems to be typically Cyprinodont\*; the vertebrae number about 40 (9+31) and there are seven pairs of ribs inserted on transverse processes. The minute pelvic fins of the female are supported by a correspondingly minute pair of pelvic bones.

In the female (fig. 4, A) the visceral anatomy shows but little departure from the structure seen in carnivorous Fundulinae, except for modifications due to the anterior position of the vent and of the openings of the urinary and genital ducts. The large air-bladder is placed posteriorly; the stomach is a simple expansion of the alimentary canal, without caeca, and from it the intestine runs straight back on the left side to the air-bladder, turns downward and crosses above the ovary to the right side, and then runs straight downwards and forwards to the anus; the liver is large. The ureters arise close together from the posterior end of the kidney, which seems to be unpaired; they unite to form a single duct, which runs downwards and forwards below the intestine on the right side of the ovary and across below the latter to the urinary opening. The ovary is unpaired, as in many other Cyprinodonts; it is a pyriform organ that lies in front of the air-bladder and occupies the whole width of the body; it narrows anteriorly and opens almost directly to the exterior, there being practically no oviduct.

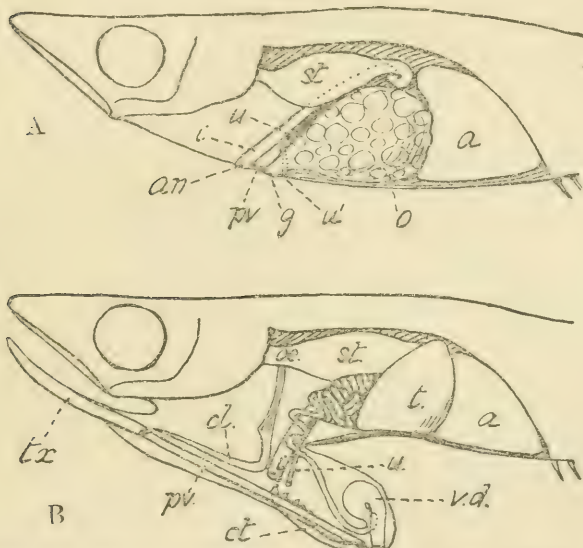
In the male (fig. 4, B) the unpaired testis is very similar in form to the ovary, but is shorter and deeper and does not extend so far forward; the vas deferens leaves it anteriorly and immediately becomes closely coiled up into a mass that lies in front and to the right side of the testis, and is rather similar in form but less in bulk than the latter; within this mass

\* In order to investigate the structure I had series of sections made of the anterior half of the body in two specimens (♂ and ♀); these were of great assistance in making clear certain features that could not be made out by ordinary dissection.



the walls of the duct are thick and glandular, and from its narrowed anterior end it emerges and runs with one or two loops into the priapium at the posterior end of its junction with the body, and then backwards and downwards near the surface of the aproctal side of the priapium to above the base of the ctenactinium, when it passes to the proctal side and coils round in a complete circle before opening to the exterior; this terminal coil has very thick muscular walls.

Fig. 4.



*Phallostethus dunckeri*. Dissection of female and male (partly reconstructed). The pectoral arch and muscles of the left side have been removed; also the liver, which occupies nearly all the space between oesophagus and intestine and almost surrounds the stomach.

*æ.*, oesophagus; *st.*, stomach; *i.*, intestine; *an.*, anus; *a.*, air-bladder; *u.*, ureter; *u'.*, urinary opening; *o.*, ovary; *g.*, opening of oviduct; *t.*, testis; *v.d.*, vas deferens; *pv.*, pelvis; *cl.*, priapial process of cleithra.

The intestine enters the priapium a little in front of the vas deferens and runs downwards and obliquely across to the anus; the kidney-duct accompanies the intestine and opens to the exterior just behind it.

Immediately in front of the intestine a bony process runs downwards from the cleithral symphysis to just in front of the vent, and is produced forwards as a bony rod that forms a

skeletal support for the priapium ; it tapers anteriorly and extends on the proctal side nearly to the anterior end. A mid-ventral rod of bone runs the whole length of the priapium ; the toxactinium articulates with its anterior end, the ctenactinium with its posterior end ; it seems probable that these are modified pelvic fin-rays and that the bony rod with which they articulate is the pelvis. The last-named lies between a pair of longitudinal muscles which also run the whole length of the organ and are more or less symmetrically arranged except in the region of the anus, where they send out a dorsal branch that runs on the aproctal side of the priapium right up into the body and is attached high up on the inner side of the cleithrum of the proctal side. The anal and urinary openings and in front of them the prolongation of the cleithra mentioned above lie directly above these ventral muscles. A pair of dorsal muscles also run the whole length of the priapium, lying nearly symmetrically and directly above the ventral muscles except in two regions : (1) the region of the anus, where the cleithral process and the intestine separate them from the ventral muscles and with the cleithral branch of the latter displace them towards the proctal side ; (2) the region of the terminal coil of the vas deferens ; here the dorsal muscles unite, taper, and are confined to the aproctal side.

The pectoral muscles attached to the expanded hyporacoids are continued forward into the dorsal part of the priapium, tapering anteriorly and ending above the base of the toxactinium.

It is evident that the priapium is an intromittent organ. Probably its distal end is brought close against or just within the genital aperture of the female, and the ctenactinium is used to hold it in position ; the toxactinium may also assist in this ; the dorsal and ventral longitudinal muscles of the priapium are probably concerned chiefly with the movement of these two bony appendages. Contraction of the cleithral branch of the ventral priapial muscles would doubtless bring the distal part of the organ nearer the body, whilst the reverse effect would be produced by contraction of the pectoral muscles that pass into it anteriorly. The great length of the vas deferens may be due to the need for the plentiful supply of a glandular secretion in which the spermatozoa may live.

It is very remarkable that this little fish should have developed so complex an organ for the purpose of internal fertilization. The whole structure of the priapium is quite unlike that of any other copulatory organ known among fishes, and I believe that the coiling of the vas deferens to form a

sort of epididymis is also unique, as well as the wide separation of the openings of the urinary and genital ducts. No doubt the remoteness of the genital orifice from the anal fin has precluded the use of the latter as an intromittent organ, as is done in the viviparous groups of the family; in this case there is no evidence as to whether the fish is viviparous or not.

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LXIX.—*Description of a new Loricariid Fish of the Genus Plecostomus from Rio Janeiro.* By C. TATE REGAN, M.A.

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*Plecostomus rachovi*, sp. n.

Depth of body 5 in the length, length of head  $3\frac{1}{2}$ . Depth of head  $1\frac{3}{4}$  in its length, breadth  $1\frac{1}{4}$ , length of snout  $1\frac{1}{2}$ , diameter of eye 8, interorbital width  $2\frac{2}{5}$ . Length of mandibular ramus 3 in interorbital width; in either jaw 20 to 22 teeth on each side. Snout ovate; supraorbital edges not elevated; temporal plates weakly carinate; occipital process well developed, somewhat acutely pointed, with a low median ridge; posteriorly it is bordered by several scutes. 32 scutes in a longitudinal series, 8 or 9 between dorsal and adipose fin, 15 between anal and caudal; upper and anterior scutes weakly carinate; lower surface of head and body covered with granular scales. Dorsal I 7; first ray a little longer than head, when laid back reaching seventh scute behind last, which is  $\frac{1}{2}$  as long. Anal I 4. Pectoral spine reaching anterior  $\frac{1}{4}$  of pelvis. Caudal emarginate. Caudal peduncle  $3\frac{1}{3}$  as long as deep. Body with dark spots, about one on each scute; spots on head smaller and more numerous; fins with several transverse bars or series of spots.

A single specimen, 135 mm. in total length, from near Rio Janeiro, presented to the British Museum by Herr A. Rachow.

This resembles *P. laplatæ*, Eigenm. (*P. tæniatus*, Regan), from the La Plata, in the large number of scutes, in having the occipital process bordered by several, in the rather small eye, &c. It differs in the narrower snout and smaller mouth, broader interorbital region, longer and more pointed occipital process, keeled anterior scutes, higher dorsal fin, and caudal fin barred instead of plain.

LXX.—*On some recently received Rhynchota.*

By W. L. DISTANT.

## HETEROPTERA.

## Coreidæ.

*Namacus nympha*, sp. n.

Head, pronotum, and scutellum pale testaceous, more or less thickly blackly punctate; corium dull ochraceous, thickly blackly punctate, the apical margin narrowly dull testaceous; membrane bronzy olivaceous; body beneath ochraceous; legs fuscous brown in male, black in female, the femora in male streaked beneath with ochraceous; antennæ black, third joint annulated at base with ochraceous, first joint incrassated, slightly curved, second joint a little longest, fourth moderately thickened, central lobe triangularly somewhat laminately produced in front of the antenniferous tubercles; rostrum reaching the intermediate coxæ; ocelli much nearer eyes than to each other; pronotum with the anterior angles acutely, porrectly prominent, a transverse impression near anterior margin defining a broad anterior collar, thickly punctate with a faint central longitudinal linear impression, the posterior angles slightly nodulose, the basal area distinctly, transversely depressed; membrane with the veins prominent, only slightly furcate; anterior femora in male distinctly shortly spined beneath in apical area.

Long., ♂ 15 mm., ♀ 17 mm.

*Hab.* Brit. Guiana; New Amsterdam, Public Gardens; on stems of aquatic plants (*G. E. Bodkin*).

Apparently allied to *N. prominulus*, Stål, from Surinam, but that species is described as having "lobus medius capitis prope basin denticulo armatus," the lateral angles of the pronotum in *N. nympha* are slightly nodulose; membrane not black, but bronzy olivaceous, &c.

## Lygæidæ.

*Paromius pallidus*.

*Plociomerus pallidus*, Montrouz. Ann. Soc. Linn. Lyon. 1865, p. 229.

*Plociomerus seychellesus*, Walk. Cat. Het. v. p. 120 (1872).

*Paromius seychellesus*, Dist. Faun. Brit. Ind., Rhynch. ii. p. 50, fig. 37 (1904).

Montrouzier's name must now take precedence over that of Walker. I have seen a specimen of the first-named from



New Caledonia. It is found in Ceylon, Burma, Japan, Seychelle Islands, and New Caledonia.

## HOMOPTERA.

### Cicadidæ.

#### *Platypleura badia*.

*Platypleura badia*, Dist. Ann. Mus. Civ. Gen. xvii. p. 453, t. iv. f. 6 a, b (1888).

At the time of the description of this species and until now, I only knew *P. badia* by the female form from Tenasserim. The British Museum has recently received a male example from Burma, which I now describe:—

Opercula short, broad, and overlapping inwardly, not passing the base of abdomen, obtusely rounded laterally and apically; rostrum reaching base of abdomen; body beneath somewhat longly pilose.

Long., excl. tegm., ♂ 16 mm.; exp. tegm. 52 mm.

*Hab.* Lower Burma; Toungoo Distr. (*G. C. Clarence*).

### INTHAXARA, gen. nov.

♂. Head (including eyes) about as wide as base of mesonotum, ocelli a little farther apart from eyes than from each other, front depressed, a little shorter than vertex; pronotum considerably shorter than mesonotum, the lateral margins moderately amplified and more or less distinctly toothed and angulated; mesonotum (including basal cruciform elevation) as long as head and pronotum together; abdomen considerably longer than space between apex of head and base of cruciform elevation; tympana covered, tympanal flaps about as broad as long; opercula short, very widely separated, not passing the first abdominal segment, which is centrally, longitudinally sulcate, second, third, and fourth abdominal segments furnished with a strongly developed tubercle near each lateral margin; rostrum reaching the posterior coxæ; tegmina and wings hyaline, the first with the basal cell longer than broad, apical areas eight, the lowermost continued along the inner margin; wings with six apical areas.

I place this genus before *Leptopsaltria*, from which it is distinctly separated by the second, third, and fourth abdominal segments being tuberculated, &c.

#### *Inthaxara rex*, sp. n.

♂. Body above more or less finely palely pilose; head, pronotum, and mesonotum brownish ochraceous; lateral

areas of front, area of ocelli, and a spot at inner margins of eyes, two central, longitudinal, strongly angulated fasciae, the fissures, and two spots on posterior margin near each lateral angle of pronotum, a central longitudinal fascia, on each side of which is a shorter, broader, and much angulated fascia, followed by a small spot on anterior margin, the margins of a large obconical spot on lateral areas, and spots before the basal cruciform elevation to mesonotum black; abdomen paler brownish ochraceous, the margins of the segments well defined, more strongly palely pilose than above; head beneath and sternum brownish ochraceous; face and clypeus ochraceous; anterior margin of face black, enclosing an ochraceous spot, its posterior area with a central spot and margin black; legs and rostrum virescent, anterior tibiae ochraceous, apices of femora and tibiae and apical halves of anterior tarsi black; opercula slightly longer than broad, outer margins moderately sinuate, inner margins almost straight, apical margins slightly rounded, widely separated, the inner margins not passing the posterior trochanters; tegmina and wings hyaline; tegmina with the venation brownish or fuscous, basal cell, costal membrane, a curved line following base of second ulnar area and terminating on upper margin of fourth ulnar area, basal margins of the apical areas, and spots on the apices of the longitudinal veins to apical areas fuscous brown; wings with the margins at apical angles palely infusate.

Long., excl. tegm., ♂ 30 mm.; exp. tegm. 85 mm.

*Hab.* Frontier of Laos, East Annam (*R. Vitalis de Salvaza*).

*Leptosaltria phra*, sp. n.

♂. Body above brownish ochraceous, more or less finely palely pilose; lateral margins of front, area of the ocelli continued to base of vertex by two longitudinal lines, a curved line in front of eyes, two central lines united posteriorly, anterior margin, most of the fissures, posterior and subposterior margins, and a spot near lateral angles of pronotum, the margins of two obconical spots divided by a central percurrent line, some irregular sublateral spots and two small obconical spots near each anterior angle of the cruciform elevation to mesonotum, and the posterior margins of the abdominal segments black; apex of abdomen above and beneath black; body beneath and legs brownish ochraceous, bases of tibiae and apices of tarsi piceous; tegmina and wings hyaline, venation black, the first with the basal cell, costal membrane, and a spot on venation at base of upper ulnar

area testaceous, transverse veins at bases of second, third, and fifth apical areas infuscated; rostrum reaching basal margin of second abdominal segment; face centrally very finely longitudinally sulcate, the transverse striations broad and mostly black; opercula reaching base of second abdominal segment, apical margins oblique, apical angles rounded; lateral margins of pronotum distinctly toothed; second and third ventral segments with distinct lateral tubercles; head (including eyes) narrower than base of mesonotum.

Long., excl. tegm., ♂ 22 mm.; exp. tegm. 66 mm.

*Hab.* Near Lao Kay, Upper Tonkin (*R. Vitalis de Salvaza*).

Allied to *L. andamanensis*, Dist., but opercula shorter and broader, apex of abdomen black, &c.

*Haphsa nana*, sp. n.

Head, pronotum, and mesonotum pale greenish ochraceous; head with a curved central spot on front, the area of the ocelli, an angularly curved fascia before each eye, and anterior angle of vertex black; pronotum with two central longitudinal lines, which are outwardly curved anteriorly and posteriorly, the fissures and anterior area of lateral margin black; mesonotum with four ill-defined obconical black spots more or less margined with ochraceous, the two outermost longest, and between these and the central spots a smaller anterior marginal black spot, a rounded black spot in front of each anterior angle of the basal cruciform elevation; abdomen above dark ochraceous, the central and apical areas black; body beneath and legs ochraceous, most of the striations to face black; tegmina and wings hyaline, venation mostly ochraceous, the costal membrane to tegmina greenish, and the basal transverse veins to second and third apical areas moderately infuscated; rostrum reaching the apices of the posterior coxæ.

Long., excl. tegm., ♂ 25 mm.; exp. tegm. 73 mm.

*Hab.* Indo-China (*R. Vitalis de Salvaza*).

In general appearance closely allied to *H. nicomache*, Walk., but differing in the size and shape of the opercula, which are shorter (only reaching the base of the third abdominal segment), their apices broader and more roundly truncate, and their inner margins more widely separated.

*Platylomia operculata*, sp. n.

Head, pronotum, and mesonotum brownish testaceous: posterior margin of pronotum and basal cruciform elevation

to mesonotum ochraceous; margins of the ocelli, a spot at anterior angles of vertex, and the margins of two obconical spots to mesonotum black; abdomen above castaneous, more or less greyishly pilose; head beneath, sternum, legs, and opercula brownish ochraceous; abdomen beneath a little paler than above, posterior margin of penultimate segment black; tegmina and wings hyaline, the venation brownish or fuscous; face longitudinally sulcate on its posterior area, the transverse ridges prominent; rostrum not passing the posterior coxæ; opercula long, reaching the posterior margin of the penultimate abdominal segment, concavely sinuate on both sides near base, widest beyond middle where they are inwardly and outwardly convex, the apex narrowed and convexly rounded.

Long., excl. tegm., ♂ 55 mm.; exp. tegm. 140 mm.

*Hab.* Indo-China (*R. Vitalis de Salvaza*).

Allied to *P. radha*, Dist., but differing in the shape of the opercula, which are a little longer than in that species, with their apices much less suddenly narrowed and considerably broader and convexly rounded.

*Meimuna subviridissima*, sp. n.

Head, pronotum, and mesonotum greenish ochraceous, more or less finely greyishly pilose; head more or less suffused with blackish; pronotum with two central longitudinal lines, which are sinuate posteriorly, and the fissures black; mesonotum with a central longitudinal lanceolate spot, on each side of which is an irregularly black-margined obconical spot, followed by a small anterior spot and a broad submarginal fascia black; abdomen dull sanguineous, with a central segmental series of transverse spots, not always found on the apical segments, and a lateral segmental series of small spots black; head beneath, sternum, legs, and opercula virescent, more or less greyishly pubescent; abdomen beneath dull sanguineous; tegmina and wings hyaline, venation virescent or olivaceous; face longitudinally sulcate for about apical two-thirds, transverse striations distinct; rostrum reaching the posterior coxæ; opercula in ♂ somewhat broad, reaching the fourth abdominal segment, well separated from each other, only convexly oblique on their apical areas, their apices convexly rounded.

Long., excl. tegm., ♂ 37 mm.; exp. tegm. 95 mm.

*Hab.* Frontier of Laos, East Annam (*R. Vitalis de Salvaza*).

Allied to *M. tripurasura*, Dist., but differing in the structure of the opercula, which in the ♂ are more rounded and



less oblique, much broader, their inner margins convex and their apices broader and convexly rounded.

*Meimuna rava*, sp. n.

♂. Head, pronotum, and mesonotum dull ochraceous; lateral margins of front, area of the ocelli, on each side of which is a slightly curved fascia, and anterior angles to vertex, two central curved fasciæ and the fissures to pronotum, a central lanceolate fascia, followed on each side by the broken margins of an obconical spot, a small acute basal spot, a broad sublateral fascia, and a spot near each anterior angle of the basal cruciform elevation to mesonotum black; abdomen above pale castaneous, the segments more or less shaded with black; body beneath and legs ochraceous; face with the transverse striations black, but much less completely so towards clypeus; tegmina and wings hyaline, the venation more or less brownish ochraceous; rostrum reaching the posterior coxæ; opercula just passing the apical margin of the fourth abdominal segment, their apices shortly acute, outer margins concavely sinuate before middle, inner margins roundly oblique.

Long., excl. tegm., ♂ 26 mm.; exp. tegm. 78 mm.

*Hab.* Frontier of Laos, East Annam (*R. Vitalis de Salvoza*).

Allied to *M. tavoyana*, Dist., but differing in the shorter opercula and their very much less attenuated and angulated apices.

*Terpnosia posidonia*.

*Terpnosia posidonia*, Jacobi, SB. Ges. Naturf. Berl. 1902, p. 22; id. Zool. Jahrb. 1905, p. 434.

*Cicada stipata*, Walk. List Hom. i. p. 155 (1850), nom. præocc.

*Terpnosia?* *stipata*, Dist. Ann. & Mag. Nat. Hist. (7) xvi. p. 553 (1905).

*Terpnosia walkeri*, Dist. Syn. Cat. Homopt. i. (Cicadidae) p. 78 (1906), nom. nov.

Jacobi redescribed Walker's species, of which the type was an unlocalized female specimen. Walker's name *stipata* was preoccupied by himself in the genus, and it therefore had to be renamed, which I did, as *T. walkeri*. But, as Jacobi had redescribed the species in 1902, which I now find by seeing specimens for the first time in this collection, his name has priority and must take precedence.

The black longitudinal fascia to the face is sometimes almost obsolete.

*Gæana annamensis*, sp. n.

Body and legs black; ocelli, anterior margin (narrowly) and posterior margin (broadly) of pronotum, two strongly curved discal fasciæ proceeding from the anterior angles of the cruciform basal elevation, and a lateral spot on each side of mesonotum, and the exposed lateral margins of the metanotum testaceous; tegmina black, opaque, the apical margins a little paler between the veins, a large pale greenish-white basal patch beneath the radial vein, containing a black spot, an irregular angulated spot on middle disk, with a lunate spot beneath it, and three smaller subapical spots greenish white; wings black, about basal half irregularly greenish white, and a subapical spot of the same colour; face prominent, distinctly centrally longitudinally sulcate, the transverse ridges somewhat prominent; rostrum reaching the posterior coxæ; opercula in ♂ small, not passing the first abdominal segment, lateral margins nearly straight, apical margins rounded; tegmina narrow, three times as long as broad.

Long., excl. tegm., ♂ 36 mm.; exp. tegm. 86 mm.

*Hab.* Frontier of Laos, East Annam (*R. Vitalis de Salvaza*).

Allied to *G. vitalisi*, Dist., but differing in the narrower tegmina, different markings, &c.

*Gæana sultana*, sp. n.

♂. Body and legs black; ocelli shining golden yellow; anterior margin (narrowly) and posterior margin (much more broadly) to pronotum, two central, longitudinal, much angulated fasciæ, a lateral streak, and angular projections to basal cruciform elevation to mesonotum, and exposed margins of metanotum ochraceous; tegmina opaque, greyish brown, basal cell black, a large patch beneath radial area, an angulated transverse fascia beyond radial area, and some spots on apical area orange-yellow, veins brownish; wings greyish brown, apical areas fuscous, enclosing a greyish-brown spot before apex, and with a strong greyish-brown indentation near anal area, a black submarginal line; head longer than pronotum, front somewhat perfectly produced; greatest breadth of tegmina more than one-third of their length; opercula small, not reaching base of abdomen; rostrum just passing posterior coxæ.

Long., excl. tegm., 33 mm.; exp. tegm. 86 mm.

*Hab.* Frontier of Laos, East Annam (*R. Vitalis de Salvaza*).

## Cercopidæ.

*Tomaspis bogotensis*, sp. n.

Black, obscurely finely greyishly pilose; tegmina with two costal pale ochraceous spots situate respectively about one-third from base and one-third from apex; head and pronotum with a distinct central longitudinal ridge, head distinctly foveately hollowed on each side of the central ridge; pronotum transversely wrinkled and finely punctured; scutellum foveately depressed; face prominent, compressed, centrally longitudinally ridged, transverse striations distinct; posterior tibiæ with a strong spine before apex.

Long. 8 mm.

*Hab.* Bogota (*I. M. Vargas Vergara*).

Allied to *T. ruida*, Dist., from Ecuador.

This species is locally known by the name of "Mion," and is most destructive to pasture-land.

LXXI.—*Descriptions of new Lizards in the Collection of the British Museum.* By G. A. BOULENGER, F.R.S.

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*Gymnodactylus asper*.

Agrees very closely with *G. miliusii*, Bory, except in the much larger and spine-like tubercles on the back and tail, and in the coloration, the upper parts being uniform yellowish, without any markings. The size of the specimen on which this species is founded exceeds that of the largest *G. miliusii* preserved in the British Museum.

	mm.
Total length .....	185
Head .....	32
Width of head .....	25
Body .....	78
Fore limb .....	40
Hind limb .....	48
Tail .....	75

Milparinha, Western New South Wales, from the collection of Mr. P. Schrader.

*Pygopus schraderi*.

Readily distinguished from *P. lepidopus* by the smaller scales, the dorsals further differing in being but feebly keeled, and in the shorter tail. 29 scales round the body, 97 pairs of large ventrals. 14 femoral pores. Pale reddish brown above, head with large dark brown blotches above, one on the occiput being connected with a broad crescentic dark brown band on the nape; a dark brown bar on the lips below the nostril, a second below the eye, and a spot between the latter and the nuchal band, which involves the ear.

From snout to vent 65 mm.; tail 60.

A single young specimen, also from Milparinha, received with the *Gymnodactylus asper*.

*Gerrhonotus gadovii*.

Head-shields smooth; three large præfrontals forming a triangle or the azygous shield (= frontonasal) in contact with the frontal; two pairs of shields between the azygous præfrontal and the rostral, with or without a small shield between the anterior pair; nasal well separated from the rostral; two superposed postnasals; two or three loreals; two or three outer supraoculars and four to six supraciliaries; ten or eleven upper labials. Side of neck with granular scales. Lateral fold very strong. Dorsal scales in 16 or 18 longitudinal series (8 on the nape), the 8 median series strongly keeled, the others feebly keeled; 42 to 48 transverse series from occiput to base of tail. Ventral scales nearly as large as dorsals, in 12 longitudinal series. The adpressed fore limb reaches the eye or not quite so far; hind limb one-half to three-fifths the distance between axilla and groin. Tail subquadrangular and often a little compressed at the base, once and three-fifths to once and two-thirds as long as head and body; upper caudal scales nearly as strongly keeled as the dorsals. Brown or brownish olive above, with small darker spots or lichen-like darker and lighter variegations; sides with dark and light spots, often with black, light-edged vertical bars, which may be produced obliquely, as chevrons, on the back; a dark brown or black streak on each side of the head, passing through the eye, bordered below by a yellowish-white streak extending to the angle of the mouth; upper lip more or less spotted or speckled with brown or black; lower parts yellowish or greenish white, more or less profusely dotted or spotted with black.



	mm.
Total length .....	240
Head .....	23
Width of head .....	16
Body .....	69
Fore limb .....	22
Hind limb .....	29
Tail .....	148

Two specimens were obtained at Omilteme, Guerrero, Southern Mexico, by Dr. H. Gadow a few years ago, and I referred them to *G. liocephalus*. A number of specimens, from the same locality, contained in a collection made by Mr. H. H. Smith, and recently presented to the British Museum by Mr. F. D. Godman, show the necessity of proposing for them a new specific name. *G. liocephalus* differs in the more elongate body, with more numerous transverse series of scales, in the longer head, and in the coloration.

*Lygosoma kitsoni*.

Section *Riopa*. Body elongate, limbs moderate; the distance between the end of the snout and the fore limb is contained about once and a half in the distance between axilla and groin. Snout short, rounded. Lower eyelid scaly. Supranasals present, small; rostral broadly in contact with the frontonasal, which forms a narrow suture with the frontal; latter as long as or a little longer than the frontoparietals, in contact with the first and second supraoculars; four supraoculars; eight supraciliaries, first largest; frontoparietals distinct, larger than the interparietal; parietals in contact behind the interparietal, followed by a pair of nuchals; fifth upper labial largest and below the eye. Ear-opening small, oval, with two or three small projecting lobules in front. 30 smooth scales round the body, subequal in size. Præanals not enlarged. The adpressed limbs fail to meet. Digits short; fourth toe a little longer than third, with 11 lamellæ inferiorly. Tail tapering from the base, not more than once and a half as long as head and body. Brown above, with some small blackish spots on the vertebral region and a dark brown lateral band edged above with lighter; lower parts white.

	mm.
Total length .....	120
Head .....	10
Width of head .....	7
Body .....	40
Fore limb .....	10
Hind limb .....	15
Tail .....	70

This species is described from two specimens: one obtained in the Western Province of Southern Nigeria by Mr. A. E. Kitson, and presented by him in 1908; the other from Bibi-anaha, Gold Coast, presented by Dr. H. G. F. Spurrell in 1912.

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LXXII.—*Description of a new Cyprinodont Fish from the Sobat River.* By G. A. BOULENGER, F.R.S.

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*Haplochilus kingii.*

Depth of body  $3\frac{1}{3}$  to 4 times in total length, length of head 3 to  $3\frac{1}{2}$  times. Head flat above; snout very short, shorter than eye, which equals postorbital part of head; mouth directed upwards, lower jaw projecting; interorbital width  $1\frac{1}{3}$  to  $1\frac{1}{2}$  times diameter of eye; præorbital  $\frac{1}{3}$  to  $\frac{1}{2}$  diameter of eye. Dorsal 6–7, originating  $1\frac{3}{4}$  to 2 times as far from eye as from root of caudal, above middle or posterior third of anal; longest ray about  $\frac{2}{3}$  length of head. Anal 11–12. Pectoral about  $\frac{3}{4}$  length of head, extending to beyond base of ventral; latter small, equally distant from end of snout and from root of caudal. Caudal rounded, as long as or a little longer than head. Caudal peduncle a little longer than deep. 26–27 scales in longitudinal series, 16 round body in front of ventrals. Yellowish, the scales on the sides and back finely edged with brown, the black powdered with brown; fins whitish, dorsal, anal, and caudal sometimes blackish (males).

Total length 34 mm.

This little fish is very closely related to *H. schoelleri*, Blgr., and *H. loati*, Blgr. It was discovered in a khor on the Sobat River by Mr. H. H. King, Entomologist to the Sudan Government Department of Education, who has presented five specimens to the British Museum.

LXXIII.—*New Mammals from South America.*

By OLDFIELD THOMAS.

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*Alouatta inclamax*, sp. n.*Mycetes niger*, Thos. P. Z. S. 1880, p. 394 (nec Geoff.).*Alouatta æquatorialis*, Elliot, Primates, i. p. 274 (partim., nec Festa).

Fur of medium length. Hairs of crown and forehead all sloping downwards towards the face.

General colour black. Under surface mixed black and buffy, the inconspicuous lateral mantle cream-buff. Hands mixed black and buffy. Thighs black along their antero-external edge only, their hinder and lower sides conspicuously buffy, contrasting strongly with the general black colour. Lower legs blackish all round; feet mixed black and buffy. Tail black for three-fourths its length above, its under surface and terminal fourth whitish buffy.

*Hab.* Intac, about 50 miles N. of Quito, Ecuador.

*Type.* Adult male. B.M. no. 80. 5. 6. 2. Collected July, 1877, by Clarence Buckley.

Buckley's Intac Howler, the first American mammal on which I ever had occasion to write, was preserved until recently as a flat skin, and this gave it a certain appearance of abnormality, while its sex was not then ascertainable. Now, however, that it has been remade, the sex becomes evident, while the colour proves to be of quite normal distribution. I can, however, find nothing to match it exactly, its yellowish thighs and tail-tip and its forwardly-directed frontal hairs distinguishing it readily from the other black Howlers.

Its relationship is probably with *A. caraya*\* and *villosa*, but the former has only a trace of yellowish on the thighs, and the latter has none at all.

Dr. Elliot assigned the specimen to Festa's *A. æquatorialis*, but that animal is said to be chocolate-brown, and not black.

*Alouatta palliata quichua*, subsp. n.

The N. Ecuador race of *A. palliata*.

General characters as in *A. palliata* of Central America, but the lateral mantle-hairs much more warmly coloured,

\* By the kind assistance of Mr. Davies Sherborn I am enabled to state that Humboldt's "Tableau synoptique des Singes de l'Amérique" (Rec. Obs. Zool. i. pp. 353-363) was published by the 7th August, 1912, while Geoffroy's "Tableau des Quadrumanes" (Ann. Mus. d'Hist. Nat. xix. pp. 85-122) only appeared in the first week of October of the same year. *Simia caraya*, Humboldt, therefore antedates *Stentor niger*, Geoff.

near ochraceous tawny of Ridgway, instead of cream-buff. Posterior back finely ticked with buffy, the hairs commonly black with buffy (ochraceous-buffy) tips, while in *palliata* there is a variable mixture of completely black or buffy (cream-buff) hairs. Tail with many of its hairs buffy, especially towards its tip.

Skull in general like that of *palliata*, but on the average the mesopterygoid fossa is more squarely open anteriorly and the zygomata are less broadened vertically, especially in their anterior part. Thus in male and female *quichua* the vertical height anteriorly is 11 mm. and 10 mm., while in *palliata* it is 14 mm. and 12 mm. respectively, the general size of the skulls being about the same.

Dimensions of male and female specimens, measured in the flesh, the female the type :—

Head and body 530 and 485 mm.; tail 595 and 582; hind foot 145 and 130.

Skulls: greatest length 113, 104; condylo-basal length 102, 90.5; zygomatic breadth 81, 73; combined length of premolars and molars 36, 34.5.

*Hab.* N.W. Ecuador. *Type* from the Rio Blanco, 20 miles W. of Mindo (about 79° 10' W., on Equator). Alt. 2500'. Other specimens from Mindo, 4200'.

*Type.* Adult female. B.M. no. 13. 10. 24. 1. Original number 145. Collected 26th June, 1913, by Gilbert Hammond. Presented by Oldfield Thomas.

On laying out the fair series now available of *A. palliata*, the general difference between the buffy-sided specimens from Central America and the present more tawny-mantled set from Ecuador becomes very evident. The buffy-ticked back, tendency to have a yellow-tipped tail, and the cranial points above mentioned are further indications of subspecific distinction.

*Callicebus personatus brunello*, subsp. n.

Among the Titi Monkeys in the British Museum which have been referred to *Callicebus personatus* there appear to be two different forms, one from the N.E. corner of São Paulo, no doubt that which also occurs near Rio Janeiro itself, and another from the State of Espiritu Santo, whence a good series of it were sent by Mr. A. Robert.

The original *Callithrix personatus* of Geoffroy was without any more exact locality than "Brésil," and its description is too brief to be distinctive, though the words "Pelage cendré-fauve" correspond better with the Espiritu Santo form than with the more southern one.

Apart from Humboldt, who merely reproduced Geoffroy's



diagnosis, the next author after Geoffroy to mention the species is Desmarest, who describes fairly fully what he identifies as *C. personatus* from specimens brought by Auguste Saint-Hilaire from the coast-region between  $18^{\circ} 30'$  and  $21^{\circ}$  S. on the rivers Itabapuna and others, including the Rio Doce, Espiritu Santo—therefore from quite the region where Mr. Robert's series was collected.

In spite, therefore, of Spix, Burmeister, and other authors identifying the Rio Janeiro Titi with *C. personatus*, it seems to me that Desmarest's determination, being the first, should be accepted, especially as he probably had for examination the type described by Geoffroy eight years before. This type would seem to have disappeared by 1851, as it is not mentioned in Isidore Geoffroy's Catalogue of that date.

In the Espiritu Santo specimens the upper surface and especially the nape, shoulders, and arms down to the wrists are broadly washed with pale greyish white. From this the more southern form may be distinguished as follows:—

General characters as in true *personatus*, including the extent of black on the face, crown, ears, hands, and feet, and in this respect similarly differing from *C. nigrifrons*, in which only a narrow frontal band is black, the crown being dark grey. Whole of upper surface greyish brown, this colour extending uniformly over the nape, shoulders, and back. Under surface similarly brown, without any tinge of reddish on the chest. Fore limbs proximally a similar greyish brown, inconspicuously speckled with buffy, very different from the conspicuously whitish forearms of true *personatus*; hands and wrists black. Hind limbs similar, the greyish brown extending to the ankles. Tail dull reddish.

Dimensions of the type (measured in the flesh):—

Head and body 380 mm.; tail 420; hind foot 100; ear 30.

Skull: greatest length 70; condylo-basal length 58.5; breadth of brain-case 35; front of canine to back of  $m^3$  19.3.

*Hab.* São Paulo and Rio Janeiro Provinces. Type from Piquete, N.E. São Paulo. Alt. 600 m.

*Type.* Adult male. B.M. no. 1. 6. 6. 3. Collected 23rd Jan., 1901, by Alphonse Robert.

### *Rhogeessa bombyx*, sp. n.

Largest species of the genus.

Size decidedly larger than in *R. tumida*, the largest species of restricted *Rhogeessa* as yet described. General characters as in that species, the ears similarly reaching, when laid forward, about to the tip of the nose. Colour above and

below yellowish, darkened by the blackish tips to the hairs; but, owing to the specimens being preserved in spirit, an exact determination of the shade is not possible. Membranes uniformly black. Ears slender, their front margin slightly and evenly convex; tip narrow; outer margin slightly concave below tip, then convex to the base. Tragus with its inner margin straight, its outer margin convex, crenulate, a well-marked lobule at its base. Glands at backs of ears large and prominent. Wings to the base of the outer toe. Tail involved in membrane to its tip.

Skull, as compared with that of *R. tumida*, conspicuously larger and heavier in all dimensions. Brain-case more swollen, the frontal profile consequently more convex. Occipital protuberance well marked.

Teeth as in *R. tumida*, but larger throughout. Lower incisors of the normal proportions, not as in *Bæodon*.

Dimensions of the type (measured on the spirit-specimen):—

Forearm 32 mm.

Head and body 44; tail 29; ear 14; tragus on inner edge 5; third finger, metacarpus 29.5, first phalanx 11.8, second phalanx 10.3; lower leg and hind foot (c. u.) 18.3.

Skull: greatest length 14.5; basi-sinual length 10.4; zygomatic breadth 10; interorbital breadth 4.8; front of canine to back of  $m^3$  5.2; front of  $p^4$  to back of  $m^2$  3.5.

*Hab.* Condoto, Choco, Colombia. Alt. 300'.

*Type.* Old male in spirit. B.M. no. 13. 10. 29. 1. Collected by Dr. H. G. F. Spurrell. One specimen.

It will be seen from the above measurements that while the forearm of this bat is not longer than is occasionally found in *R. tumida*, its skull is decidedly larger in all dimensions.

### *Nectomys hammondi*, sp. n.

A glossy brown species related to *N. russulus*.

Size rather less than in the common grey forms of *Nectomys*, such as *N. squamipes*, *garleppi*, and their allies, markedly smaller than in *saturatus*, larger than in *russulus*. General colour "tawny olive," strongly lined and darkened with black, the dorsal area markedly darker than the sides. Flanks clearer tawny. Under surface not sharply defined, dull greyish, the bases of the hairs dark slaty, their tips dull whitish slightly tinged with tawny (more strongly tawny in the second specimen). Forearms and metacarpals dark brown, digits paler brown, thinly haired. Hind legs tawny olive; upper side of feet uniformly greyish brown, the scaling of the skin unusually clearly marked; fifth hind toe, without claw, reaching to the end of the first phalanx of the fourth.

Skull slender; upper profile strongly bowed at fronto-nasal suture, concave in interorbital region, convex again on brain-case. Nasals unusually broad anteriorly, and not strikingly narrowed behind. Supraorbital ridges fairly well developed, but not rising vertically, continued back to the outer corners of the interparietal. Outer plate of zygomatic root but little projected forwards in front of the upper bridge. Palatal foramina rather short, widely open. Lateral pits and foramina on each side of the posterior palate but little developed. Bullæ small.

Dimensions of the type (measured in the flesh):—

Head and body 203 mm.; tail 251; hind foot 32; ear 18.

Skull: greatest length 43; condylo-incisive length 39; greatest breadth 21.5; nasals  $16 \times 5.6$ ; interorbital breadth 7.7; breadth between ridges on parietals 13.7; zygomatic plate 4.6; palatilar length 19; diastema 12; palatal foramina  $6.7 \times 4$ ; upper molar series 6.8.

*Hab.* Mindo, N.W. of Quito, Ecuador. Alt. 4213 ft.

*Type.* Adult female. B.M. no. 13. 10. 24. 58. Original number 168. Collected 4th July, 1913, by Gilbert Hammond. Presented by Oldfield Thomas. Two specimens obtained.

The genus *Nectomys* falls into two groups, firstly, the common widely spread and dominant species related to *N. squamipes* (*N. apicalis*, *garleppi*, *fulvinus*, &c., &c.), all of which are approximately of the same size and general character of coloration, and, secondly, a few isolated species differing widely in size and general characters, but none the less showing their relationship to the ordinary *Nectomys* by their glossy fur and heavily ridged skulls. Of these *N. russulus* is the nearest in size to *N. hammondi*, but is still a good deal smaller, while *N. esmeraldarum* and *N. dimidiatus* are again conspicuously smaller. On the other hand, *N. saturatus*, from Ibarra, Ecuador, is altogether a larger and heavier animal.

It is probable that such species as the present are rather less aquatic in their habits than the members of the *squamipes* group.

### *Oryzomys arenalis*, sp. n.

A very small pale form of the "*Oligoryzomys*" group.

Size less than in any of the allied species. General colour above near "clay-colour," the underlying colour buffy, lined with dark brown. Head slightly greyer and less buffy. Sides buffy, a more or less distinct buffy line edging the belly. Under surface creamy white, with a slight shade of

buffy, the bases of the hairs slaty. Ear with the proectote little darkened. Chin white. Hands and feet white. Tail long, brown above, creamy white below.

Skull a miniature of that of *O. stolzmanni*, the anteorbital plate of zygoma well developed, projecting forwards. Brain-case not specially enlarged. Interorbital space narrow, the narrow part long and evenly curved, not specially divergent posteriorly; supraorbital edges sharply square.

Dimensions of the type (measured in the flesh):—

Head and body 80 mm.; tail 100; hind foot 21; ear 15.

Skull: greatest length 22.5; condylo-incisive length 19.4; zygomatic breadth 11.4; nasals 7.8; interorbital breadth 3; brain-case breadth 10.5; palatilar length 8.8; palatal foramina 4.1; upper molar series 3.

*Hab.* Coast desert of N.W. Peru. Type from Eten; sea-level.

*Type.* Adult male. B.M. no. 0.3.1.60. Original number 574. Collected 14th September, 1899, by P. O. Simons. Presented by Oldfield Thomas.

This is a small pale desert species of the widely spread group with well-developed anteorbital plate to the zygoma and normal-sized brain-case. In these respects it agrees with the much larger *O. stolzmanni*, and differs widely from *O. minutus*, *dryas*, and their allies. Perhaps its nearest ally is *O. munchiquensis*, Allen, from W. Colombia, but that is a mountain form, and is not nearly so pale as *O. arenalis*.

*Eligmodontia morgani pamparum*, subsp. n.

Essential characters of the Patagonian *E. morgani*, but paler throughout. General colour above pale mouse-grey, with but little buffy suffusion; an inconspicuous buffy line edging the ventral colour on the lower flanks. Under surface pure white, the hairs white to the bases except just along the sides of the belly, where they have grey bases; in true *morgani* all the hairs of the under surface (except just on the chin and interramia) have broad dark slaty bases.

Skull as in true *morgani*.

Dimensions of the type (measured in flesh):—

Head and body 75 mm.; tail 80; hind foot 20; ear 17.

Skull: greatest length 23.4; condylo-incisive length 20.2; upper molar series 3.6.

*Hab.* Southern Argentine Pampas. *Type* from Peru Station, F.C.P.; about 200 kilometres N.W. of Bahia Blanca.

*Type.* Adult female. B.M. no. 13.11.1.6. Original number 8. Collected 2nd August, 1913, and presented by F. H. F. Parkes, Esq.



Distinguishable by the practically complete whiteness of the belly-hairs.

*Philander laniger senex*, subsp. n.

Like *Ph. l. derbianus*, with the following exceptions:—Head more entirely grey, the grey itself nearly white; mesial dark streak much less developed, almost imperceptible. Light withers' mark more prominent, light grey. Under surface only whitish on small patches in chest and inguinal regions, the rest, and inner sides of the limbs, washed with pale tawny, like sides, but less glossy. Hind limbs like sides, not greyish. Hairy part of tail hoary grey; difference between upper and lower extent of fur about  $1\frac{1}{2}$  inches.

Dimensions of the type (measured in the flesh):—

Head and body 257 mm.; tail 410; hind foot 44; ear 33.

*Hab.* Mindo, Ecuador. Alt. 4200'.

*Type.* Adult female. B.M. no. 13.10.24.75. Original number 150. Collected 25th June, 1913, by Gilbert Hammond. Presented by Oldfield Thomas.

This beautiful *Philander* is no doubt nearly allied to *Ph. l. derbianus*, found in Colombia to the north of it, but may be distinguished by its more prominently grey head and tawny-washed under surface.

*Marmosa sobrina*, sp. n.

Related to *M. fuscata* of Merida, but with a pale line down the centre of the underside.

Essential characters, including the narrow unridged skull, as in *M. fuscata* and *incana*. General colour above of exactly the same brown as *M. fuscata*, mummy-brown on the back grading into a drabby brown on the sides; quite without the warm shade—approaching to rufous—of some of the Peruvian species, such as *impavida*, Tschudi, and *madescens*, Osgood. Face as in *M. fuscata*. Under surface, from chin to anus, cream-buff along the centre, the pale area varying from about a quarter of an inch wide on the belly to three-quarters on the chest, the hairs pale to the roots; on each side of the belly the hairs are slaty basally, greyish terminally. Hands and feet dull whitish. Tail uniformly dark brown to tip, the terminal half of the underside inconspicuously lighter.

Skull very long and narrow, decidedly longer than in *fuscata* and *madescens*. Nasals slightly expanded behind. Interorbital region smoothly rounded, without beading.

Dimensions of the type (measured in flesh):—

Head and body 123 mm.; tail 156; hind foot 18; ear 20.5.

Skull : greatest length 37·4 ; condylo-basal length 36 ; zygomatic breadth 18·2 ; nasals 17·6 × 3·7 ; interorbital breadth 6·2 ; breadth of brain-case 12·6 ; palatal length 21 ; maxillary tooth-row 15 ; three anterior molariform teeth 6.

*Hab.* Mindo, N.W. of Quito, Ecuador. Alt. 4200'.

*Type.* Adult male. B.M. no. 13. 10. 24. 70. Original number 163. Collected 3rd July, 1913, by Gilbert Hammond. Presented by Oldfield Thomas.

This is a representative of *M. fuscata*, with a light line down the under surface as in certain of the Peruvian species. It may be really closest to Osgood's *M. madescens*, but has not that animal's warm colour, which is as in *M. impavida* and other members of the *murina* group. Nor has it a white tip to the tail.

LXXIV.—*Descriptions of some new Forms of Antelope, with Notes.* By the Hon. WALTER ROTHSCHILD, F.R.S., Ph.D.

*Adenota kob* and its allies.

The forms of this group are very puzzling, owing to their undergoing a seasonal change of pelage. The yellow-eared forms differ, after the change, by an increase of white round the eye and in an increased appearance of black on the legs. The white-eared forms after the change are much redder, owing to the shedding of the black hairs, which are replaced by rufous. I am of opinion that all the smaller kob antelopes of this section, both yellow-eared and white-eared, are only local races of one species, the oldest name for which is *kob* of Erxleben, 1777, and, in point of distribution and coloration, they should stand in the following order :—

*Adenota kob pousarguesi*, Neum.

Congo.

*Adenota kob kob*, Erxl.

Gambia to Niger.

*Adenota kob neumanni*, Rothsch.

District west of Lake Albert.

*Adenota kob thomasi*, Neum.

Central and Southern Uganda.

*Adenota kob notata*, Rothsch.

Southern Soudan, Ahmed Aga, &c.

*Adenota kob nigroscapulatus*, Matschie.

Bahr-el-Gazal.

*Adenota kob leucotis*, Licht. & Pet.

Nile above Khartoum.

A key to the forms is as follows:—

- |    |  |                                 |
|----|--|---------------------------------|
| 1. | { No white above eye, pelage deep rufous,<br>ears yellow .....             | <i>A. kob pousarguesi</i> .     |
|    | { White above eye, ears yellow .....                                       | 2.                              |
| 2. | { White above eye mixed with pale yellow,<br>pelage fulvous .....          | <i>A. kob kob</i> .             |
|    | { White above eye pure, not confined to<br>area above eye .....            | 3.                              |
| 3. | { White running down slightly on to nose,<br>space below eye yellow .....  | <i>A. kob neumanni</i> .        |
|    | { White above eye extended, space below<br>eye whitish or pure white ..... | 4.                              |
|    | { White above eye, whitish below .....                                     | <i>A. kob thomasi</i> .         |
| 4. | { Above, below, and behind eye and face<br>white .....                     | <i>A. kob notata</i> .          |
|    | { Dark parts black or brown, ears white ..                                 | 5.                              |
| 5. | { Dark parts brown or yellowish brown....                                  | <i>A. kob nigroscapulatus</i> . |
|    | { Dark parts uniform black .....   | <i>A. kob leucotis</i> .        |

*Adenota kob neumanni*, subsp. n.

♂. Differs from *A. kob kob* by the larger, longer, and stouter horns, and by the white over the eye running down over the tear-duct on to the nose. Face entirely fulvous yellow; ears uniform yellow on outer surface with narrow black tip.

*Hab.* Lake Albert Edward.*Adenota kob notata*, subsp. n.

♂. Differs from *A. kob neumanni* and *A. kob thomasi* in having the whole region round the eye, above and below, to base of ears and horns white, as well as a large portion of face and nose. Ears on outer surface pale buff, with basal portion white, no black tip.

*Hab.* Southern Soudan, Ahmed Aga on the Bahr-el-Abiad, &c.*Taurotragus derbianus congolanus*, subsp. n.

Differs from *T. derbianus derbianus* and *T. d. gigas* in both sexes by the horns.

♂. Horns gigantic and comparatively longer and more slender; those of the type exceed any measured pair of *T. d. gigas*. Spiral twist starts much more on front of forehead. Anterior crest of this spiral passes round the back of the horns *only once*, NOT *twice* as in *derbianus derbianus*; the distance between base of horn and second frontal point of the twist is much greater than in either of the other two forms.

Space between horn-cores narrower than in *d. gigas*, but not so narrow as in *d. derbianus*.

Hair on forehead and between horns dark blackish chestnut, not bright reddish fulvous as in the other two forms.

♀. Horns much straighter and much more slender than in the other two forms, and more strongly ribbed in basal area. The horns run straight back from the skull, the points only turned outwards in the last two or three inches.

Length of horns, ♂  $42\frac{1}{4}$  inches = 1098 mm.

♀  $25\frac{1}{16}$  " = 650 "

*Hab.* Eastern Congo ; ♂, Ubanghi District ; ♀, N.W. Tanganjika.

*Bubalis tora digglei*, subsp. n.

♂. This is quite distinct from the four other races of *Tora* Hartebeest. It belongs to the uniform fulvous section, viz., *tora tora* and *tora rahatensis*. It differs from both in being much darker, almost rufous. The principal differences, however, lie in the skull and horns. The skull is, measured from the basion, 399 mm., as opposed to 380 mm. in length in *tora rahatensis*; the nasal bones reach further back towards the eye-orbits, and are narrower and more pointed at each end, and the skull at base of horn-cores is much broader. The horns are much less bracket-shaped than in either of the other forms, much closer together, and the terminal portion nearly twice the length of the same in the others; the terminal portion is also much more bent back, and the points are directed straight backwards as in *Bubalis major*. They thus differ entirely from all four other races, where the points are directed upwards, and in *t. tora* and *t. swaynei* outwards, while in *t. rahatensis* and *t. noacki* they turn inwards.

*Horns*: length  $20\frac{1}{4}$  inches = 526 mm., girth  $9\frac{1}{2}$  inches = 247 mm., width between tips  $12\frac{3}{4}$  in. = 332 mm.

*Hab.* Keili, northwards along the Ofat River on the Soudan Abyssinian frontier.

The type was got by Lieutenant W. H. Diggle out of a considerable herd, along with two other specimens, and several others were got by the Hon. T. G. B. Morgan Grenville. In his description of *Bubalis tora rahatensis*, Mr. Oscar Neumann draws attention to hybrids between that and *B. leluwel leluwel*, and on reading the above description some people might think these were such hybrids; but I have seen several of these undoubted hybrids, which are all characterized by much thicker horns, with shorter points—and, moreover, are always uniques or found in very small numbers in the herds of either parent, never in large herds by themselves, as the specimens of my new form were.



LXXV.—*A Synopsis of the Genus Tinamus.* By LORD BRABOURNE, F.Z.S., M.B.O.U., and CHARLES CHUBB, F.Z.S., M.B.O.U.

OUR work in connection with the Birds of South America enables us to present the following synopsis of the genus *Tinamus*.

No work on the entire group has appeared since the publication of Count Salvadori's Monograph in the Twenty-seventh Volume of the 'Catalogue of the Birds in the British Museum,' which was issued in 1895.

Much research, however, has since been conducted in every branch of ornithology, and this group has casually benefited. The differentiation of the species into subspecies in this genus is attended with some difficulty on account of the small number of specimens in collections.

We have, however, to acknowledge our indebtedness to the Hon. Walter Rothschild for the loan of his fine collection, whilst Prof. L. Dollo has most courteously allowed the collection in the Brussels Museum to be forwarded to the British Museum (Natural History) for comparison. The types of *T. peruvianus*, Bonap., and *T. blasiusi*, Dubois, are contained in this collection, and have been carefully examined by us. We have also to express our thanks to Dr. Otto Fuhrmann at Neuchâtel, who was good enough to send us the type of *T. kleei* for examination. Through the kindness of these gentlemen we have been able to bring together a larger and more representative collection than has hitherto been available.

As a result, we can now recognize six species occurring in South America, whilst twelve subspecies can be differentiated; and from the examination of these specimens we anticipate that, with a larger amount of material, other subspecies will be separated.

We now admit *Tinamus tao tao*, Temm., from Central and Northern Brazil; *T. t. kleei*, Tschudi, from Peru; and *T. t. septentrionalis*, subsp. n., from Guiana, Venezuela, and Colombia.

*T. guttatus*, Pelz., from Northern Brazil, Eastern Ecuador, and Peru, has no subspecies, yet the series at our disposal differs, more or less, from each locality whence we have specimens. The same remark applies to *T. solitarius*, Vieill., from Paraguay and South-east Brazil. Of *T. major*, Gmel., five subspecies are admitted: *T. m. major*, Gmel., Guiana and North Brazil; *T. m. ruficeps*, ScL. & Salv., Ecuador, E. Peru, and Colombia; *T. m. castaneiceps*, Salvadori, West Colombia,

extending to Panama; *T. m. serratus*, Spix, Venezuela, Central and Northern Brazil; *T. m. peruvianus*, Bonap., Peru. *T. latifrons*, Salvadori, is still represented by two examples from Western Ecuador. *T. robustus inexpectatus* is a new subspecies from N. Ecuador.

The type of *blasiusi*, Dubois (Mém. Soc. Zool. France, 1894, p. 404), is, as Count Salvadori stated (Cat. B. Brit. Mus. xxvii. p. 498, 1895), an example of *T. tao kleei*, Bonap., but it is certainly not the bird that Bonaparte described in the 'Comptes Rendus' (Paris), xliii. p. 573 (1856). *T. blasii*, Gray (List Spec. Birds Brit. Mus. part v., Gallinæ, 1867, p. 101), is a nomen nudum, and Dubois's name must be separately treated.

We describe herewith:—

*Tinamus tao septentrionalis*, subsp. n.

Differs from *T. tao tao* by the absence of the broad black bars on the upper surface, which are replaced by fine vermiculations, especially on the upper back, where the general colour is olive; the underparts are also more finely vermiculated and the breast almost uniform lead-grey.

Total length 580 mm.; culmen 41; wing 281; tail 105; tarsus 77.

*Type.* ♀. Plains of Cumana, Venezuela; in Rothschild Museum, Tring. ♂ and other specimens in British Museum.

*Tinamus robustus inexpectatus*, subsp. n.

*Adult male.* General colour above chestnut olive-brown, barred with black; upper tail-coverts more uniform and margined at the tips with rufous-buff, tail-feathers chestnut-brown mottled with black; bastard-wing, primary-coverts, and quills dark brown, the secondaries mottled with rufous-brown on the outer webs, some of the innermost mottled on both webs at the tips; crown of head entirely black; sides of face and hind neck sandy-buff, minutely barred with black; ear-coverts blackish; chin dull white; fore neck more inclining to olive, with a submarginal line of black to the feathers, which gives a scalloped appearance; breast and sides of body olive-brown, with black and white frecklings on the middle of the abdomen; lower flanks and thighs pale buff, barred with dark brown; the extreme lower portion of tibia uniform brown; under tail-coverts bright rufous-buff, coarsely mottled with dark brown; under wing-coverts brown, some with pale margins; greater series and inner

edges of primaries ash-grey. "Bill black, below light grey; feet grey; iris brown" (*Miketta and Fleming*).

Total length 367 mm.; culmen 37; wing 237; tail 80; tarsus 70.

*Type.* ♀. Salidero, North Ecuador; in British Museum. ♂ and other specimens in British Museum and in the Rothschild Museum, Tring.

This bird is recorded by Dr. Hartert as *T. latifrons* (Nov. Zool. ix. p. 599, 1902), but it is quite different from the two examples of that species, and is undoubtedly closely allied to *T. robustus*, Selater, from Central America.

The following key will aid to future determination:—

*Key to the Species.*

- A. General colour slate-blue, washed more or less with olive.
  - a. Olive wash absent; broadly barred with black on the upper surface, including the mantle and entire back; sides of abdomen faintly barred with buff ..... *tao tao*.
  - b. Olive wash present; sides of abdomen boldly barred with buff and dark brown ..... *tao kleei*.
  - c. Olive wash predominant; upper surface finely vermiculated, the cross-bars more obscure and restricted to the lower back and rump. .... *tao septentrionalis*.
- B. General colour above olive-brown or chestnut-brown.
  - d. Smaller: wing less than 200 mm.; with buffy-white spots on the wings ..... *guttatus*.
  - e. Larger: wing more than 200 mm.; wings without buffy-white spots.
    - a'. Crown of head olive-brown; a longitudinal ochraceous line on each side of the hind neck ..... *solitarius*.
    - b'. Crown of head bright rufous; no lines on the hind neck; back dark olive-brown.. *major ruficeps*.
    - c'. Crown of head chestnut; back dark olive-brown; bars on wing-coverts very pronounced ..... *major castaneiceps*.
    - d'. Crown of head chestnut; back pale olive-brown; bars on wing-coverts almost obsolete..... *major peruvianus*.
    - e'. Crown of head cinnamon-rufous; back pale olive-brown ..... *major serratus*.
    - f'. Crown of head maroon-chestnut; back pale olive-brown ..... *major major*.
    - g'. Fore part of head slate-colour; nape chestnut..... *latifrons*.
    - h'. Entire crown of head black ..... *robustus inexpectatus*.

The ranges cannot be accurately determined, however, by the few specimens which we have from each locality, which show considerable variation.

LXXVI.—*Descriptions of new Genera and Species of*  
Noctuidæ. By Sir GEORGE F. HAMPSON, Bart., F.Z.S.

THE following paper forms a seventh supplement to the first thirteen volumes of the 'Catalogue of Lepidoptera Phalænæ in the British Museum,' 1898–1913. As, however, Supplementary Volumes of the Catalogue to vols. i. to iii. will shortly be issued, descriptions of the species belonging to the Families classified in those volumes are reserved for the Supplement.

The former papers appeared in the Ann. & Mag. Nat. Hist. ser. 7, vol. viii. pp. 165–186 (1901), vol. xi. pp. 337–351 (1903), vol. xv. pp. 425–453 (1905), vol. xix. pp. 221–257 (1907), and ser. 8, vol. iv. pp. 344–388 (1909), and vol. viii. pp. 393–445 (1911).

The numbers before the species indicate their position in the classification adopted in those volumes. The types are in the British Museum.

Noctuidæ.

AGROTINÆ.

49 a. *Chloridea conifera*, sp. n.

♂. Head and thorax whitish mixed with brown; palpi white at base; fore legs darker brown; abdomen yellowish mixed with brown, the ventral surface whitish. Fore wing whitish tinged with brown and irrorated with dark brown, the discal area whiter; small blackish subbasal spots at costa and median nervure; antemedial line black, reduced to points on costal half, oblique to submedian fold, then inwardly oblique and incurved at vein 1; a conical blackish patch from middle of costa enclosing the reniform, which has a faint pale annulus, an indistinct oblique line from it to inner margin; traces of a dark postmedial line excurved to vein 4, then incurved; subterminal line dark, with some dark suffusion before it on costal area, slightly excurved below vein 7; a lunulate black terminal line; cilia dark brown. Hind wing yellow; the base dark brown, emitting a short streak on vein 1, the inner margin reddish brown; a large black discoidal lunule; the terminal area black-brown, its inner edge excurved at middle, then incurved; a yellow patch on termen between veins 4 and 2; cilia whitish towards tornus; the underside with the costal half whitish, the termen towards apex and the patch at middle whitish.

*Hab.* TRANSVAAL, Johannesburg (Cooke), 1 ♂ type.  
*Exp.* 30 mm.



193 b. *Timora umbrifascia*, sp. n.

♀. Head and thorax dark brown tinged with grey; antennæ whitish; palpi, frons, pectus, and legs dark brown; abdomen grey-brown, the ventral surface dark brown. Fore wing whitish tinged with red-brown; a dark brown fascia in and just below the cell extending to termen, with a white fascia on it in discal fold from middle of cell to near termen, pointed at extremities; the terminal area suffused with dark brown. Hind wing white, the margin tinged with brown; the veins with slight brown streaks towards termen; cilia brown at base, whitish at tips; the underside white, the costal and terminal areas tinged with red-brown and irrorated with dark brown.

*Hab.* NIGERIA, Zungeru (*Macfie*), 1 ♀ type. *Exp.* 34 mm.

268 c. *Micragrotis melanomesa*, sp. n.

♂. Head and tegulæ white slightly tinged with rufous; palpi black except at tips; frons black at sides; antennæ black ringed with white towards base; thorax black mixed with whitish and rufous, the metathorax with white patch; pectus and legs whitish mixed with dark brown, the tarsi blackish ringed with white; abdomen red-brown, the ventral surface white tinged with red-brown. Fore wing grey-white tinged with rufous and striated with brown, the terminal area grey-white striated with brown; subbasal line double, black filled in with white, from costa to vein 1, some black suffusion beyond it on costa and below the cell; antemedial line double, blackish, strong and filled in with white at costa, bent outwards to inner margin, the cell beyond it black; orbicular white, small, elliptical, confluent with a patch on costal area; reniform small, white slightly defined by blackish and with some blackish in centre; postmedial line double, black and filled in with white towards costa, bent outwards below costa, then very indistinct and excurved with a series of dark points on its outer edge, a black patch beyond it on costal area, with some white points on costa; a faint dark subterminal shade defining the whiter area; a terminal series of small black spots; cilia fuscous, with a fine white line at base. Hind wing semihyaline white; the underside with the costal area irrorated with brown, a postmedial series of black points on the veins, and black points on apical half of termen.

*Hab.* BR. E. AFRICA, Nairobi (*Anderson*), 1 ♂ type. *Exp.* 24 mm.

440 a. *Euxoa phaeochroa*, sp. n.

♂. Head and thorax dark red-brown slightly mixed with greyish; tarsi ringed with white; abdomen reddish brown tinged with grey, the ventral surface whitish irrorated with brown. Fore wing dark red-brown tinged with grey; blackish subbasal spots on costa and below the cell; antemedial line with double blackish spots at costa, then waved and strongly angled outwards above inner margin; orbicular a small brown spot; reniform faintly defined by brown; a diffused brown medial line, oblique to lower angle of cell, then waved; postmedial line with small blackish spot at costa, slightly bent outwards below costa, then dentate, excurved to vein 4, then oblique, some pale points beyond it on costa; subterminal line faint, pale defined on inner side by very slight dentate red-brown marks, excurved below vein 7 and at middle, the area beyond it slightly darker; cilia reddish ochreous with brown lines near base and at middle. Hind wing white tinged with red-brown; a slight discoidal spot, curved postmedial line, and a terminal line; the underside with the costal area irrorated with blackish, the postmedial line diffused.

*Hab.* PERU, Acopampa (*Watkins*), 1 ♂ type. *Exp.* 30 mm.

772 a. *Agrotis griseofusca*, sp. n.

♂. Head and thorax glossy black-brown; pectus and legs black-brown, the tarsi ringed with white; abdomen pale ochreous, the ventral surface suffused with brown. Fore wing black-brown with a silvery blue-grey gloss; antemedial line fine, black, very highly dentate outwards in the interspaces and inwards on the veins, the tooth in cell extending nearly to the reniform, which is small, with blackish centre and ochreous annulus defined by black; postmedial line indistinct, black, bent outwards below costa, then produced to short streaks on the veins, incurved below vein 4; the veins of terminal area slightly streaked with black; a terminal series of minute black points. Hind wing pure white, the costa and cilia towards apex fuscous; the underside with the costal area irrorated with brown except at base.

*Hab.* BR. E. AFRICA, Nairobi (*Anderson*), 1 ♂ type. *Exp.* 30 mm.

772 b. *Agrotis rufescens*, sp. n.

♂. Head, thorax, and abdomen rufous mixed with some dark brown; antennae blackish; legs dark brown, the tarsi

slightly ringed with white; ventral surface of abdomen suffused with dark brown. Fore wing rufous slightly irrorated with brown; the costal area suffused with black-brown except at apex, interrupted at the lines; a minute whitish spot at base of costa defined on outer side by black; subbasal line represented by double oblique black strizæ filled in with white from costa and a whitish spot below the cell, a fine sinuous black streak in submedian fold from it to the antemedial line, which is double, brown filled in with whitish, very highly angled outwards in the interspaces and inwards on the veins; orbicular and reniform small, rounded, and defined by black, closely approximated and connected by a black streak in discal fold; postmedial line double, brown filled in with whitish, bent outwards below costa, then minutely dentate, incurved below vein 4 and angled outwards at vein 1, some minute white points beyond it on costa, and blackish points on the veins. Hind wing white, the costa tinged with brown towards apex, the underside with the costal area irrorated with brown.

*Hab.* N. NIGERIA, Minna (*Macfie*), 2 ♂ type. *Exp.* 24 mm.

778 a. *Agrotis melamesa*, sp. n.

♀. Head ochreous tinged with red-brown; antennæ blackish; palpi irrorated with blackish except towards tips; thorax red-brown mixed with grey and slightly irrorated with blackish; pectus and legs ochreous suffused with brown, the tarsi dark brown with pale rings; abdomen grey-brown. Fore wing greyish suffused with red-brown, the costal area suffused with black-brown except at apex, interrupted at the lines; subbasal line double, brown filled in with whitish, sinuous, from costa to submedian fold; antemedial line double, blackish filled in with whitish, oblique, waved; orbicular and reniform small, incompletely defined by black, a quadrate black patch between them and two slight black marks on outer edge of reniform; a sinuous dark medial line from cell to inner margin; postmedial line indistinct, double, filled in with whitish, strongly bent outwards below costa, then with double black points at the veins, incurved below vein 4, some minute white points beyond it on costa; traces of a pale sinuous subterminal line; a terminal series of minute black points. Hind wing white slightly tinged with brown, the cilia whiter except at apex; the underside with the costal area irrorated with brown, a postmedial dark bar from costa.

*Hab.* N. NIGERIA, Minna (*Macfie*), 2 ♀ type. *Exp.* 26 mm.

779 a. *Agrotis ustula*, sp. n.

♂. Head and thorax dark red-brown, the tegulæ except at tips yellow mixed with red, and with slight red medial line; pectus and legs black-brown, the throat ochreous, the fore coxæ bright rufous, the tarsi ringed with ochreous; abdomen pale red-brown, the ventral surface ochreous. Fore wing pale ochreous yellow suffused with fiery red, except the base and the cell and area just below it to the antemedial line, the inner area suffused with blackish except at base; a fine black streak in submedian fold before the antemedial line, which is double, blackish, dentate, bent inwards to inner margin; orbicular pale ochreous yellow with small black spot in centre, its outer edge produced to a point confluent with the reniform, which has a greyish centre defined by black and ochreous-yellow annulus on inner side only; an oblique dark shade from lower angle of cell to inner margin; postmedial line double and black at costa, strongly bent outwards below costa, then represented by an oblique series of black points on the veins defined on outer side by ochreous points, the veins beyond them streaked with black; the terminal part of costa black with a series of pale points; an ochreous apical patch, the termen below it with a series of black points; cilia ochreous with slight dark line near base except towards apex and intersected with black at veins 6 to 4. Hind wing semihyaline white faintly tinged with brown, a slight discoidal point and terminal line; the underside with the costal area tinged with ochreous and irrorated with brown, a black discoidal spot, postmedial series of minute streaks on the veins and terminal series of small black spots from apex to vein 2.

*Hab.* BR. E. AFRICA, Nairobi (*Anderson*), 1 ♂ type. *Exp.* 28 mm.

841 a. *Episilia cirphidia*, sp. n.

♂. Head and thorax red-brown mixed with grey and some fuscous; abdomen grey suffused with red-brown. Fore wing grey tinged with red-brown and thickly irrorated with dark brown; a dark brown fascia below median nervure; a minute black spot in middle of cell and two discoidal spots; a whitish streak in discal fold from the discocellulars to before termen, with dark red-brown fascia above and below it, met by an oblique red-brown shade from termen below apex; a terminal series of minute black spots; cilia whitish, with a brown line near base. Hind wing pale red-brown; cilia whitish, with a red-brown line through them; the



underside whitish tinged with red-brown, the costal area irrorated with brown.

*Hab.* PERU, Acopampa (*Watkins*), 1 ♂ type. *Exp.* 40 mm.

841 b. *Episilia leucaniades*, sp. n.

♂. Head and thorax bright red-brown; abdomen fuscous brown, the anal tuft red-brown. Fore wing bright red-brown irrorated with a few black scales; a blackish streak along terminal part of median nervure and above vein 4 to before termen; two minute black points in middle of cell and a discoidal point; a terminal series of minute black spots. Hind wing dull reddish brown tinged with grey; cilia grey, with a brown line through them; the underside with the costal half brownish white, irrorated with a few black scales, the inner half dark brown, a terminal series of minute black spots.

*Hab.* PERU, Acopampa (*Watkins*), 1 ♂ type. *Exp.* 36 mm.

891 a. *Episilia pyronota*, sp. n.

♂. Head and basal half of tegulae white slightly tinged with red; antennae fuscous except towards base; palpi red, the second joint with some black at sides, the tips whitish; terminal half of tegulae and thorax bright chestnut-red, the tegulae with white line towards tips; pectus and legs whitish tinged with red, the tibiae streaked with black, the tarsi blackish at extremities; abdomen whitish tinged with red, the dorsum suffused with fuscous, a sublateral series of black spots. Fore wing whitish suffused with bright chestnut-red except on costal area, the median nervure streaked with white, the veins of terminal area pale faintly defined by brown streaks; a strong black fascia below basal half of median nervure and a black streak above middle of median nervure; a small black spot in middle of cell and small discoidal lunule; a postmedial series of black points, bent outwards below costa and oblique below vein 4; a wedge-shaped blackish shade from termen at discal fold, a lunulate shade below vein 3, and a terminal series of black points. Hind wing pure white, the inner margin slightly tinged with brown; a small black discoidal point and terminal series of striae from apex to vein 2. Underside of fore wing with the disk suffused with fuscous; hind wing with the costal area tinged with rufous and irrorated with black.

*Ab.* 1. Fore wing less strongly suffused with chestnut-red.

*Hab.* PERU, Agualani (*Ockenden*), 2 ♂ type, Acopampa, 1 ♂. *Exp.* 30-34 mm.

891 b. *Episilia lacteicosta*, sp. n.

♂. Head and thorax whitish tinged with rufous; antennæ blackish except towards base; palpi rufous, white at tips and with some black at side of second joint; abdomen whitish tinged with rufous and dorsally with brown. Fore wing whitish suffused with bright rufous except on costal area and slightly irrorated with black; the median nervure streaked with white; a strong black fascia below basal half of median nervure and a black streak above middle of median nervure; a small black spot in middle of cell and larger discoidal spot with a blackish streak between their lower parts continued faintly above vein 4; a postmedial series of black points, bent outwards below costa and oblique below vein 4; a wedge-shaped black shade from termen at discal fold, a lunulate shade below vein 3, and a terminal series of black points. Hind wing pure white, the inner margin faintly tinged with brown; a small blackish discoidal spot and terminal series of black striae from apex to vein 2. Underside of fore wing with the disk suffused with fuscous; hind wing with the costa tinged with rufous and the costal area irrorated with large black scales.

*Hab.* PERU, Agualani (*Ockenden*), 2 ♂ type. *Exp.* 32–34 mm.

Genus *TRICHOPTHOTIA*, nov.

Type, *T. homogenea*.

Proboscis fully developed; palpi obliquely upturned, the second joint reaching to about middle of frons and rather broadly scaled in front, the third short, porrect; frons smooth with tuft of scales and flattened tuft above between antennæ; eyes large, round, hairy, not overhung by cilia; antennæ ciliated; thorax clothed with hair and scales mixed, the pro- and metathorax with spreading crests; tibiae moderately fringed with hair, all the tibiae spined; abdomen with some rough hair at base, but without crests. Fore wing rather long and narrow, the apex rounded, the termen evenly curved and not crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hind wing with veins 3, 4 from angle of cell or shortly stalked; 5 obsolescent from middle of discocellulars; 6, 7 stalked; 8 anastomosing with the cell near base only.

893 a. *Trichophotia homogenea*, sp. n.

♂. Head and thorax red-brown mixed with black-brown

and grey; palpi black-brown, the extremity of second joint white; tegulæ with black-brown medial line edged with white behind; tarsi black-brown ringed with white; abdomen grey suffused with brown. Fore wing grey tinged in parts with brown and irrorated with black-brown; double subbasal black stræ from costa and cell and a black fascia below the cell from the latter to the antemedial line which is formed by double black spots at costa and a double oblique waved line from cell to inner margin; claviform defined by black, moderate; orbicular and reniform defined by black, rather small, the former round, the latter with its centre defined by black-brown, a black fascia before the former and two streaks on brown suffusion between them; postmedial line with two black spots at costa, then dark brown, bent outwards below costa, then somewhat dentate with a double series of black points beyond it, strongly incurved below vein 4 and touching lower part of reniform, some black-brown suffusion beyond it on costal area with white points on costa; a wedge-shaped patch of dark brown suffusion from termen at discal fold and a lunulate patch below vein 3; a terminal series of small black lunules; a fine pale line at base of cilia followed by a brown line. Hind wing white; a blackish discoidal spot and terminal series of small spots except towards tornus; the underside with the costal area irrorated with black, a postmedial series of minute dark streaks on the veins.

Ab. 1. Fore wing more uniform brown, the dark markings in the cell and on postmedial area reduced.

*Hab.* PERU, Agualani (*Ockenden*), 1 ♂ type, Acopampa, 1 ♂. *Exp.* 30 mm.

976 b. *Lycophotia costaneata*, sp. n.

♂. Head and thorax purplish grey mixed with chestnut-red and irrorated with a few black scales; tegulæ with black-brown line near tips; antennæ blackish, whitish towards base; palpi chestnut-red, whitish at tips; sides of frons black-brown; pectus and legs chestnut-red, the tibiæ grey irrorated with blackish; abdomen grey towards base, rufous towards extremity, the ventral surface chestnut-red. Fore wing purplish grey suffused with chestnut-red, especially on terminal area, and irrorated with a few black scales; antemedial line grey defined on each side by chestnut-red, oblique, waved; a small round black spot defined by grey in middle of cell and minute discoidal lunule faintly defined by grey; postmedial line grey defined on each side by chestnut-red, bent outwards below costa, then dentate, incurved below

vein 4: a terminal series of blackish points and a fine pale line at base of cilia. Hind wing pure white; a blackish discoidal point and terminal series of striæ from apex to above vein 3; cilia tinged with rufous at apex. Underside of fore wing suffused with fuscous brown except at costa; hind wing with the costal area tinged with rufous and irrorated with black, a small discoidal spot.

*Hab.* PERU, Acopampa (*Watkins*), 1 ♂ type. *Exp.* 34 mm.

976 c. *Lycophotia carnea*, sp. n.

♂. Head and thorax bright rufous; antennæ dark brown except towards base; palpi chestnut-red except at tips, the sides of frons dark brown; pectus chestnut-red in front; tibiæ and tarsi grey-brown streaked with blackish; abdomen grey-brown, the extremity and ventral surface bright rufous. Fore wing flesh-red tinged with greyish and sparsely irrorated with black; an indistinct oblique maculate rufous antemedial line; a blackish point in middle of cell and slight dark discoidal bar; postmedial line indistinct, dark, bent outwards below costa, then dentate, excurved to vein 4, then incurved; a terminal series of black points. Hind wing pure white; a blackish discoidal point and terminal series of striæ from apex to above vein 3; cilia tinged with rufous at apex. Underside of fore wing suffused with fuscous brown except at costa; hind wing with the costal area rufous irrorated with black, a small black discoidal spot.

*Hab.* PERU, Uruhuasi, 1 ♂ type. *Exp.* 32 mm.

1014 a. *Aplectoides occidentis*, sp. n.

♀. Head and thorax violaceous grey mixed with brown; pectus and abdomen whitish tinged with rufous. Fore wing violaceous grey irrorated with brown; a curved black sub-basal line from costa to vein 1; antemedial line black defined on inner side by grey, oblique, sinuous; claviform moderate, defined by black; orbicular and reniform grey defined by black, the former oblique, elliptical, open above, a red-brown shade before and between them in and below the cell; a faint sinuous red-brown line from lower angle of cell to inner margin; postmedial line indistinct, bent outwards below costa, then somewhat dentate, excurved to vein 4, then incurved, some pale points beyond it on costa; subterminal line indistinct, whitish, excurved below vein 7 and at middle, with a slight red-brown patch before it on costa and black streaks on the veins; a terminal series of small black lunules. Hind wing whitish suffused with red-



brown, the cilia paler; the underside whitish tinged and irrorated with brown, a small dark discoidal spot and curved sinuous postmedial line.

*Hab.* CANADA, Br. Columbia, Sicamous (*Miss Ricardo*), 1 ♀ type, Peachland in Coll. Wolley-Dod. *Exp.* 34 mm.

1016 a. *Aplectoides beddeci*, sp. n.

♂. Head and thorax white tinged with ochreous and mixed with some black; palpi black at tips; tegulæ with black band near tips; abdomen white tinged with ochreous brown and with lateral black stripes. Fore wing white tinged in parts with ochreous and slightly irrorated with black, the medial area more strongly irrorated; subbasal line black, angled outwards below costa and ending at submedian fold, in which there is a slight black streak towards base; antemedial line strong, black, dentate towards costa, excurved in submedian interspace and angled inwards on vein 1; claviform defined by black and connected by a short streak with the postmedial line; orbicular and reniform strongly defined by black except above, constricted at middle, the former very small; postmedial line black, bent outwards below costa, then dentate, excurved to vein 4, then strongly incurved; subterminal line represented by a series of dentate black marks, angled outwards at vein 7 and incurved below vein 3; a terminal series of small black spots. Hind wing white tinged in parts with brown, a dark discoidal spot, postmedial line angled outwards at veins 4 and 1, and diffused subterminal band angled inwards at discal fold; a terminal series of small black spots; the underside brownish white irrorated with black, a black discoidal lunule and strong sinuous postmedial band.

*Hab.* NEWFOUNDLAND, Doyles Cadroy Valley (*Maj. Beddek*), 1 ♂ type. *Exp.* 36 mm.

1021 a. *Anytus cupola*, sp. n.

♂. Head and thorax white mixed with black-brown; frons with black bar; antennæ blackish; tegulæ with black line near tips; patagia with black streak near upper edge; pectus and legs white mixed with brown, the tarsi banded with black; abdomen white mixed with brown, the crests blackish. Fore wing irrorated with dark brown and suffused in parts with red-brown, the medial inner area suffused with red-brown giving off curved arms on outer side of antemedial and inner side of postmedial lines; a sinuous black streak below base of cell defined above by whitish; a slight

curved dark subbasal striga from costa; antemedial line indistinctly double filled in by whitish, oblique, sinuous, strongly bent inwards to inner margin; claviform defined by black, its upper edge oblique from median nervure, extending to near the postmedial line, with which it is connected by a black streak; orbicular and reniform large, pale, with slight white annuli incompletely defined by black, the former rather elliptical, the latter somewhat angled inwards on median nervure; an oblique sinuous blackish line from lower angle of cell to inner margin; postmedial line double filled in with white, the inner line strong and black below vein 5, bent outwards below costa, then excurved and minutely waved to vein 2, then incurved, some whitish points beyond it on costa; subterminal line indistinct, pale, dentate, defined on inner side by dentate black marks from below vein 6 to below vein 2 and with blackish streaks beyond it in the interspaces, except at apex, ending in the terminal series of small black lunules; cilia with a fine whitish line at base. Hind wing pure white with a black terminal line except towards tornus interrupted at the veins; the underside with the costal area irrorated with brown, a small black discoidal spot.

♀. Fore wing rather darker; hind wing suffused with brown, an indistinct curved postmedial line.

*Hab.* U.S.A., Utah, Eureka (*Spalding*), 1 ♂, 1 ♀ type.  
*Exp.* 42 mm.

1021 b. *Anytus derelicta*, sp. n.

♂. Head, thorax, and abdomen pale grey mixed with brown; palpi blackish at sides; frons with black bar; tegulae with black line near tips; tarsi banded black and whitish; abdomen with the crests blackish at tips. Fore wing bluish grey tinged with brown; a sinuous black streak below the basal half of cell; antemedial line black, angled outwards in the cell and strongly in submedian fold and above inner margin and inwards at median nervure and vein 1; claviform defined by black, pointed at extremity where it extends to the postmedial line; orbicular and reniform with slight whitish annuli defined by black, faintly above, the former oblique; postmedial line black, slightly defined on outer side by whitish towards inner margin, oblique towards costa, then dentate, incurved and stronger from vein 2 to the claviform, some white points beyond it on costa; the veins of terminal area slightly streaked with blackish; an oblique series of black streaks in the interspaces from below apex to vein 2, the streaks below vein 5

interrupted before termen; a fine blackish terminal line; cilia brown with a fine white line at base. Hind wing white tinged with brown; a slight brownish discoidal striga; a fine black terminal line and dark line through the cilia; the underside white irrorated with brown, a small black discoidal spot, traces of a postmedial line, and terminal series of black striæ.

*Hab.* CANADA, Manitoba, Aweme (*Criddle*), 2 ♂ type, Cartwright (*Heath*), 1 ♂, Alberta, Calgary (*Wolley-Dod*), 1 ♂. *Exp.* 40-46 mm.

#### HADENINÆ.

##### 1278 a. *Miselia proleuca*, sp. n.

♀. Head and thorax dark greyish brown; antennæ white towards base; pectus and legs white mixed with brown; abdomen whitish suffused with brown except towards base. Fore wing pale grey-brown thickly irrorated with black, the costal area creamy white irrorated with black towards costa; antemedial line black defined on inner side by greyish, curved, obsolete on costal area; orbicular and reniform creamy white, their centres irrorated with blackish, the former rounded, the latter rather triangular; postmedial line black, almost obsolete and excurved below costa, slightly incurved at discal fold, and oblique below vein 4; subterminal line ochreous defined on inner side by black-brown, slightly angled outwards at vein 7, then slightly curved; a terminal series of black points. Hind wing white with rather diffused brown terminal line; the underside with the costal area irrorated with black.

*Hab.* BR. E. AFRICA, Makuru (*Bodcker*), 1 ♀ type. *Exp.* 36 mm.

##### 1419 a. *Odontestra goniosema*, sp. n.

♀. Head and thorax brown mixed with grey; tarsi dark brown with pale rings; abdomen ochreous tinged with rufous. Fore wing brown suffused with purplish grey, a reddish-ochreous fascia on medial part of inner margin defined above by a black streak below submedian fold; subbasal line double, black filled in with whitish, angled outwards on median nervure, then oblique and ending at vein 1; antemedial line double, black filled in with ochreous white, slightly sinuous to submedian fold, then oblique; orbicular with pale brownish centre and white annulus defined by black, small, round; reniform whitish incompletely defined by black and its centre defined by brown,

narrow, oblique, angled inwards on median nervure, some blackish suffusion in the cell before and between the stigmata; an indistinct sinuous black line from lower angle of cell to inner margin; postmedial line double, black filled in with whitish, oblique to vein 6, then minutely waved, more strongly incurved just below vein 2, the costal area beyond it suffused with blackish and with some whitish points on the costa; subterminal line whitish defined on inner side by dentate black marks, angled outwards to termen at veins 7, 4, 3; a terminal series of small black spots. Hind wing whitish suffused with brown.

*Hab.* N. NIGERIA, Minna (*Macfie*), 1 ♀ type. *Exp.* 28 mm.

1431 d. *Hadena leucoceps*, sp. n.

♂. Head and tegulae white with some brown hairs; antennae black, ringed with white towards base; palpi and sides of frons black-brown; thorax black-brown with oblique white stripes on patagia; pectus white, brown in front; tibiae and tarsi black ringed with white; abdomen white dorsally suffused with brown, the anal tuft brown and white. Fore wing dark blue-grey; a curved white subbasal striga from costa defined on each side by black and an oblique white striga below the cell defined on inner side by black and with black patch beyond it; some white at base of inner margin; antemedial line white, interrupted below costa and at median nervure, defined on outer side by black at costa, retracted in cell, excurved below vein 1 and retracted as a white streak on inner margin defined above by black; medial area with the submedian interspace black, the claviform represented by a large clavate white patch at its extremity; orbicular and reniform white irrorated with fuscous, large, the former rather quadrate, the latter angled inwards on median nervure to the former, the cell before and between them black; postmedial line with white spot at costa, bent outwards below costa, then oblique, with white striae above and below vein 6, a white striga in submedian interspace and outwardly oblique white striga defined on inner side by black at inner margin, some white points beyond it on costa; subterminal line represented by white points on diffused black marks from below costa to vein 5, obliquely curved below vein 7, and a white striga on diffused black between veins 3 and 1; a terminal series of slight blackish points; cilia chequered white and brown. Hind wing pure white, the veins and termen suffused with fuscous; cilia with a maculate fuscous line through them;



the underside with the costal area irrorated with fuscous, a slight blackish streak in middle of cell, small discoidal spot, slight postmedial line from costa to discal fold, and terminal series of striæ from apex to vein 2.

*Hab.* PERU, Acopampa (*Watkins*), 1 ♂ type. *Exp.* 30 mm.

1431 e. *Hadena clavisigna*, sp. n.

♂. Head and thorax grey tinged with brown and mixed with black-brown; tegulae with a black line towards tips; antennae ringed black and white; frons with lateral black bars; tarsi black ringed with white; abdomen grey-brown, the anal tuft rufous. Fore wing grey tinged with brown and irrorated with blackish; double subbasal black striæ from costa and a black patch below the cell with an oblique white striga on it; antemedial line double, black, angled outwards below costa, then oblique to vein 1 where it is slightly angled inwards, then curved inwards to inner margin and filled in with white; the medial area with some dark brown suffusion in submedian interspace; claviform represented by a clavate yellowish-white mark at its extremity; orbicular with slight whitish annulus defined by black, concave towards base; reniform with slight whitish annulus defined by black, angled inwards on median nervure to the orbicular, dark brown patches in the cell before and between them and a patch beyond the reniform; postmedial line double, blackish, bent outwards below costa, angled outwards at vein 6, then oblique and somewhat dentate to vein 2, the costa beyond it blackish with some white points on it; a subterminal black-brown shade except at inner margin, incurved below discal fold and with a series of white points on it defined on each side by black except towards costa and a white striga in submedian interspace; a terminal series of black points; cilia with a series of blackish spots at base. Hind wing whitish suffused with reddish brown, especially on the veins and terminal area; cilia whitish tinged with rufous and with a red-brown line through them; the underside grey tinged with rufous and irrorated with brown, a slight discoidal striga and curved postmedial line.

*Hab.* PERU, Acopampa, 1 ♂ type. *Exp.* 32 mm.

1431 f. *Hadena uncisigna*, sp. n.

♂. Head and thorax blue-grey mixed with dark reddish brown; tegulae with dark red-brown line before tips; palpi and sides of frons dark brown; tarsi black-brown ringed with white; abdomen grey-brown, the anal tuft and ventral

surface rufous. Fore wing blue-grey suffused and irrorated with dark brown; two small black subbasal spots on costa and a black patch below the cell with an oblique white striga on it; antemedial line dark brown slightly defined on inner side by grey, oblique, waved, curved inwards and filled in with white on inner margin; claviform represented by a clavate white mark on a dark brown patch at its extremity; orbicular and reniform large, defined at sides by black, the former rounded, the latter angled inwards on median nervure, some dark brown before and between them; a rufous streak on terminal half of inner margin; postmedial line slight, blackish, bent outwards below costa, then oblique and slightly dentate, the costa beyond it with white points with black streaks between them; subterminal line represented by an oblique black bar from costa with white striga on it below vein 8, a black bar between veins 6 and 4 with two white striæ on it, and a bar between vein 3 and submedian fold with an oblique white line on it, some rufous between these markings; a terminal series of small black-brown spots tinged with rufous and a series at base of cilia. Hind wing white tinged with brown especially on the veins and terminal area; cilia white with a brown line through them; the underside whitish, the costal and terminal areas irrorated with red-brown, a black discoidal spot, sinuous brown postmedial line, and terminal series of striæ.

♀. Fore wing with the white striæ on the subterminal markings more broken up into spots.

Ab. 1. Fore wing with the clavate mark beyond the claviform reduced to a small spot.

*Hab.* PERU, Acopampa (*Watkins*), 1 ♂, 2 ♀ type. *Exp.* 28-32 mm.

1526 *b.* *Hyssia hamiltoni*, sp. n.

Antennæ of male bipectinate with moderate branches to near apex.

Head and thorax grey-white mixed with pale red-brown; antennæ black-brown; tegulæ with dark brown line near tips, whitish at base; tarsi black-brown ringed with whitish; abdomen grey suffused with pale red-brown. Fore wing reddish brown suffused with whitish, the medial area rather browner; subbasal line black-brown, sinuous, from costa to vein 1; antemedial line black-brown, oblique, sinuous; claviform obscurely defined by diffused black-brown; orbicular white defined by black, open above; reniform with diffused whitish annulus incompletely defined by black;

postmedial line indistinct, black-brown, bent outwards below costa, then slightly waved, incurved below vein 4; subterminal line formed by diffused dentate black-brown marks, angled outwards at vein 7 and excurved at middle; a terminal series of minute black-brown lunules. Hind wing whitish suffused with pale red-brown; the cilia whiter; the underside with small brown discoidal spot.

*Hab.* N. ZEALAND, Wellington (*Hamilton*), 1 ♂, 1 ♀ type. *Exp.* 44 mm.

1536 a. *Hyssia sminthistis*, sp. n.

♂. Head and thorax fuscous brown mixed with grey; palpi black-brown; tarsi dark brown with slight pale rings; abdomen dark grey-brown with some whitish at base of sides. Fore wing glossy fuscous brown tinged with grey and irrorated with a few white scales; a blackish subbasal striga from costa; antemedial line blackish, oblique to submedian fold and angled inwards on vein 1; small spots formed by elongate white scales beyond the angles of cell; postmedial line black, slightly bent outwards below costa, then dentate, oblique below vein 4, some pale points beyond it on costa; a subterminal series of small white spots formed of elongate scales and slightly defined on inner side by black; a fine ochreous line at base of cilia. Hind wing dark brown, the interspaces of basal half whitish; cilia with an ochreous line at base; the underside white thickly irrorated with brown, the terminal area suffused with brown, a black discoidal spot and diffused sinuous postmedial line.

*Hab.* PERU, Acopampa (*Watkins*), 1 ♂ type. *Exp.* 44 mm.

1538 a. *Hyssia griseata*, sp. n.

♀. Head and thorax purplish grey mixed with brown; antennæ brown, the shaft white above towards base; palpi and sides of frons dark red-brown; abdomen dark greyish brown, the anal tuft tinged with rufous. Fore wing purplish grey irrorated with dark brown; antemedial line indistinct, black-brown, oblique to submedian fold and angled inwards at vein 1; claviform defined by a few blackish scales at extremity; orbicular defined by slight oblique blackish striae at sides; reniform small and faintly defined at sides by blackish; postmedial line indistinct, blackish, excurved below costa, then forming slight lunules, oblique below vein 4; subterminal line represented by a series of slight dark brown spots in the interspaces except towards costa, somewhat wedge-shaped between veins 7 and 4; a terminal

series of black striæ; cilia whitish with brown lines near base and tips. Hind wing grey suffused with brown, the veins irrorated with dark scales; cilia white with a brown line near base; the underside grey tinged with brown, the costal and terminal areas irrorated with dark brown, a dark discoidal striga.

*Hab.* PERU, Acopampa (*Watkins*), 1 ♀ type. *Exp.* 34 mm.

1608 a. *Eriopyga diaphera*, sp. n.

Head and thorax ochreous and pale red-brown; palpi and frons at sides black; spurs with black bands; tarsi black ringed with brown; abdomen fuscous black, the anal tuft and ventral surface pale ochreous tinged with rufous. Fore wing pale ochreous tinged with red-brown and slightly irrorated with blackish, the veins with slight pale streaks; blackish subbasal striæ from costa and cell; antemedial line indistinct, brown, waved, with black points at costa, median nervure, and vein 1; a blackish point at middle of cell; reniform defined by black except at middle, where it is constricted and filled in with reddish ochreous; a diffused blackish medial line, oblique to lower angle of cell, then inwardly oblique; a faint, minutely dentate, brownish post-medial line with a series of black points on it, excurved from below costa to vein 4, then oblique, the costa beyond it with alternating pale and black points; an obliquely incurved line from apex to inner margin, approximated to the post-medial line below vein 5, black towards apex, then brown defined on outer side by reddish ochreous; a terminal series of black points; cilia with two brown lines through them. Hind wing pale ochreous brown; a terminal series of black points from apex to vein 2; cilia ochreous white; the underside ochreous white, the costal area sparsely irrorated with black, a blackish discoidal spot, a curved fuscous postmedial line with series of black points at the veins, the terminal black points prominent.

*Hab.* ECUADOR, Balzapamba, 1 ♂; PERU, Limbani (*Ockenden*), 1 ♂, 1 ♀ type, Agualani (*Ockenden*), 1 ♂, 2 ♀, Oconeque (*Ockenden*), 1 ♂. *Exp.* 36 mm.

1611 a. *Eriopyga polygrapha*, sp. n.

Head and thorax rufous slightly irrorated with dark brown; antennæ blackish, the shaft with pale rings towards base; palpi dark brown; frons with black lateral bars; tarsi dark brown with pale rings; abdomen pale reddish brown, the anal tuft pale yellow. Fore wing pale red-brown



irrorated with dark brown; subbasal line double, brown, waved, from costa to vein 1; antemedial line double, brown, oblique, waved, somewhat incurved in cell; orbicular defined by four black points and with dark shade at middle; reniform defined at sides by black points and by a white point at lower extremity, its lower part filled in with black; a diffused dark medial line, oblique to the reniform and inwardly oblique below the cell; postmedial line double, brown, oblique below costa, then dentate and the outer line produced to black points on the veins, excurved to vein 4, then incurved; subterminal line represented by a series of blackish spots in the interspaces, slightly excurved below vein 7 and at middle; a terminal series of small blackish spots; cilia with an ochreous line at base. Hind wing reddish brown, the cilia ochreous white; the underside grey-white irrorated with brown, a blackish discoidal spot, rather diffused sinuous postmedial line, and terminal series of small black spots from apex to discal fold.

*Hab.* PERU, Agualani (*Ockenden*), 1 ♂ type. Huancabamba, 1 ♀. *Exp.* ♂ 40, ♀ 46 mm.

1611 b. *Eriopyga eugrapha*, sp. n.

♀. Head and thorax dark brown mixed with ochreous; antennæ ringed ochreous and brown towards base; frons with lateral black bars; tarsi blackish ringed with ochreous; abdomen fuscous brown with some whitish at base, the ventral surface ochreous brown irrorated with dark brown. Fore wing pale red thickly irrorated with dark red-brown, the terminal area suffused with brown; subbasal line dark brown defined on outer side by pale red, waved, from costa to vein 1; antemedial line black defined on inner side by pale red, angled outwards below costa, then oblique, waved; orbicular and reniform large, with black-brown centres and pale red annuli defined by black, the former round, the latter with two white points at lower extremity; a dark brown medial shade, oblique to the reniform, then inwardly oblique; postmedial line double, blackish filled in with pale red lunules, slightly bent outwards below costa, then dentate, incurved below vein 4, some pale red points beyond it on costa; subterminal line white defined on each side by slight black spots, incurved below costa and excurved below middle; a terminal series of black points; cilia with a fine ochreous line at base followed by a waved dark line. Hind wing reddish brown, the cilia reddish ochreous; the underside grey-white irrorated with brown, a black discoidal spot,

diffused sinuous postmedial line, and terminal series of small black lunules from apex to vein 2.

*Hab.* PERU, Uruhuasi (*Watkins*), 1 ♀ type. *Exp.* 40 mm.

1641 *b.* *Eriopyga rubrirena*, sp. n.

♀. Head and thorax dark reddish brown; tarsi ringed with white; abdomen dark reddish brown with some whitish at base. Fore wing dark glossy brown tinged with grey and finely irrorated with black, the basal inner area suffused with rufous; antemedial line indistinctly double, dark, waved; reniform indistinctly defined by black, its upper part filled in with rufous and a white point in its lower extremity; postmedial line indistinct, blackish, oblique towards costa, then dentate, and oblique below vein 4; a small rufous spot just before termen at submedian fold; a fine pale line at base of cilia. Hind wing white tinged with reddish brown, the terminal area suffused with brown; cilia white with a brown line through them: the underside white thickly irrorated with brown, a black discoidal spot, indistinct postmedial line with minute black streaks at the veins, a black terminal line.

*Hab.* PERU, Acopampa, 1 ♀ type, Limbani (*Ockenden*), 2 ♀. *Exp.* 36 mm.

1649 *a.* *Eriopyga monochroa*, sp. n.

♀. Head, thorax, and abdomen reddish brown tinged with grey; antennæ pale reddish brown. Fore wing glossy reddish brown tinged with grey; traces of a sinuous brown antemedial line; reniform greyish faintly defined by brown; an indistinct brown postmedial line, oblique to vein 6, then slightly waved and incurved below vein 4; subterminal line whitish defined on inner side by brown, slightly excurved below vein 7 and at middle. Hind wing reddish brown tinged with grey, the cilia paler; the underside grey suffused and thickly irrorated with reddish brown, a dark discoidal point and rather diffused curved postmedial line.

*Hab.* PERU, Acopampa, 1 ♀ type. *Exp.* 26 mm.

1702 *a.* *Persectania basifascia*, sp. n.

Head and thorax pale grey tinged with red-brown, the antennæ browner; abdomen greyish suffused with rufous. Fore wing pale grey slightly tinged with red-brown and sparsely irrorated with black; a strong black fascia in submedian fold to below origin of vein 2; a minute sub-basal black spot in the cell; antemedial line represented by

black points on costa and vein 1 and an oblique striga above inner margin; orbicular and reniform small, incompletely defined by black, the former very narrow and elongate, a black streak between them in lower part of cell and beyond the reniform to the postmedial line with a diffused dark shade below it; postmedial line black, rather interrupted, bent outwards below costa, then strongly dentate, oblique below vein 4; subterminal line indistinct, pale, somewhat dentate, defined on inner side by diffused black-brown; a terminal series of small black lunules. Hind wing whitish suffused with pale red-brown, the cilia white; the underside white faintly tinged with red brown, a small brown discoidal spot, a slight postmedial line excurved below costa, then oblique and ending at vein 4, a terminal series of blackish lunules from apex to vein 2, then a dark line.

*Hab.* N. ZEALAND (*Hamilton*), 1 ♂, 1 ♀ type. *Exp.* 32 mm.

1797 a. *Aspidifrontia pulvereæ*, sp. n.

Head and thorax rufous mixed with blackish, the hinder part of thorax with some whitish; antennæ with the shaft whitish above; abdomen whitish tinged with rufous, the ventral surface suffused with black-brown. Fore wing greyish suffused with rufous and irrorated with black; traces of a double slightly sinuous dark antemedial line, the two lines well separated; postmedial line indistinct, dark, slightly sinuous, oblique below vein 4, a series of minute black streaks beyond it on the veins; faint traces of a dark subterminal line with blackish points at the veins; a terminal series of small black lunules. Hind wing white tinged with rufous; a fine dark terminal line; the underside with the costal area suffused with red-brown, a minute dark discoidal spot and postmedial striga from costa.

*Hab.* N. NIGERIA, Minna (*Macfie*), 1 ♂, 1 ♀ type. *Exp.*, ♂ 22, ♀ 26 mm.

1827 a. *Dasygaster albiviata*, sp. n.

♂. Head and thorax ochreous brown; palpi with blackish patch at side of second joint; frons with lateral blackish bars; vertex of head blackish; tegulæ with three blackish lines on basal half and a shade before tips; patagia with some black scales on upper edge and blackish outer edge; fore femora black-brown on inner side, the mid and hind legs with slight black-brown marks at femoro-tibial joint, the tarsi ringed black and white at extremities; abdomen reddish ochreous with sublateral black-brown spots on medial segments. Fore

wing ochreous tinged with red-brown and irrorated with black, the cell and area just below and beyond it suffused with fuscous, the median nervure, veins 4, 3 and veins 8, 7, 6 with slight white streaks except at termen; a black streak in base of submedian fold; a subbasal black striga from costa; antemedial line slight, black, oblique, dentate, angled inwards to black points on the veins; a small rufous spot defined by black scales in middle of cell; reniform small, whitish suffused with rufous and irrorated with black, a short black streak beyond its lower extremity; postmedial line slight, black, dentate and with small black lunules in the interspaces, excurved to vein 4, then oblique; an oblique white shade from apex to vein 2 beyond the cell, with black marks on its outer edge below veins 7, 4, 3; a terminal series of small black spots. Hind wing ochreous brown, the cilia whitish tinged with rufous. Underside of fore wing suffused with fuscous; hind wing white, the costal area suffused with reddish ochreous and irrorated with brown, a waved blackish postmedial line from costa to discal fold and a terminal series of small black spots from below apex to vein 2.

*Hab.* BR. N. GUINEA, Kumusi R. (*Meek*), 2 ♂ type. *Exp.* 46 mm.

1864 a. *Cirphis pyrausta*, sp. n.

♂. Head and thorax ochreous white slightly tinged with red; palpi and frons suffused with blackish; antennæ blackish behind; fore tibiæ and tarsi streaked with blackish on inner side; abdomen ochreous white suffused with brown, the ventral tufts black. Fore wing pale yellow suffused with fiery red especially on terminal area and sparsely irrorated with black; antemedial line blackish, waved, angled inwards on median nervure and vein 1, oblique to submedian fold; a whitish streak on extremity of median nervure and a black point in lower extremity of cell; postmedial line represented by a series of minute blackish lunules, oblique below vein 4, a series of yellowish streaks beyond it on the veins with black points on them; an oblique diffused yellowish fascia from apex with a brownish shade below it extending to lower angle of cell; a terminal series of black points. Hind wing white, the area beyond the cell tinged with rufous from vein 6 to submedian fold with minute postmedial blackish streaks on veins 3 and 2; the underside silvery white with terminal series of black points from apex to vein 2.

*Hab.* UGANDA, Entebbe (*Neave*), 1 ♂, Lake George (*Neave*), 1 ♂ type. *Exp.* 30 mm.



2055 b. *Leucania phæoneura*, sp. n.

♀. Head and thorax pale red-brown; antennæ brown, the shaft white towards base; abdomen grey-brown, the anal tuft and ventral surface pale red-brown. Fore wing pale red-brown, the veins and basal half of submedian fold with dark streaks; veins 6, 4, 3 defined by whitish streaks to near termen; an oblique postmedial series of dark points from discal fold to above vein 1; a fine dark terminal line; cilia ochreous with three brown streaks through them. Hind wing glossy red-brown; cilia ochreous with a brown line near base; the underside whitish suffused with brown.

*Hab.* PERU, Acopampa, 1 ♂ type. *Exp.* 34 mm.

[To be continued.]

## PROCEEDINGS OF LEARNED SOCIETIES.

### GEOLOGICAL SOCIETY.

May 28th, 1913.—Dr. Aubrey Strahan, F.R.S., President,  
in the Chair.

The following communication was read:—

‘The Internal Structure of Upper Silurian Rugose Corals from the Grindrod Collection, Oxford Museum.’ By Donald Esme Innes, B.A.

In this paper the following genera and species are described:—

*Palæocyclus porpita*, *P. fletcheri*, *P. rugosus*.

*Cystiphyllum siluriense*, *C. cylindricum*.

*Cyathophyllum* (?): a new species.

*Cyathophyllum articulatum*, *C. truncatum*.

*Strombodes murchisoni*, *Str. typus*, *Str. diffluens*.

The new species of *Cyathophyllum* (?) is of especial interest. It was figured by Milne Edwards & Haime as *Cystiphyllum cylindricum* Lonsdale, with which it has no close affinities. It combines characters of the Silurian *Cyathophylla* and *Hallia* with those of the Lower Carboniferous *Caninia*.

Particular attention is paid to the construction of a septum in the various genera, the following types being all well represented:—

(a) Radial spines on the vesicles, with their bases often connected by a web. Example: *Cystiphyllum*.

- (b) Rods placed in juxtaposition, and cemented together. Example: *Palæocyclus*.
- (c) Simple plates. Example: *Cyathophyllum articulatum*.
- (d) Crumpled plates. Example: *Cyathophyllum* (?), the new species.
- (e) Plates with backward costal prolongations. Example: *Strombodes*.

Comparison of the Upper Silurian coral facies with that of the Lower Carboniferous shows that *Cystiphyllum*, in its vesicular and spinose structure, bears a close resemblance to the compound *Michelinia*, while *Strombodes* is allied in structure to *Cyathophyllum regium* of the Viséan.

June 11th, 1913.—Dr. Aubrey Strahan, F.R.S., President,  
in the Chair.

The following communication was read:—

‘Certain Upper Jurassic Strata of England.’ By Dr. Hans Salfeld, University of Göttingen.

The writer has studied the Upper Jurassic strata of North-Western Germany, the Boulonnais, and Southern England, with special reference to the ammonites and their zones. The results of his labours are to be published in detail; but, in anticipation, he offers to the Society an epitome of his conclusions with regard to the English strata.

The localities with which he deals are the Dorset coast from Kimmeridge to Abbotsbury, and the Wiltshire exposures at Swindon and Westbury, with an incidental reference to Market Rasen. The formations concerned are the Portlandian, Kimmeridgian, and for a starting-point the Upper Oxfordian: these terms being employed in the German sense. The Upper Oxfordian = upper part of the English Corallian (+Kimmeridge Clay locally) is divided into three zones, found at Osmington, Westbury, and Swindon. The Kimmeridgian is divided into five zones, and is equal mainly to the Lower Kimmeridge Clay of English authors, with one important exception: the Abbotsbury Iron-Ore is placed as the second zone of the Kimmeridgian, and is correlated with the Market-Rasen Clays. The Portlandian is divided into nine zones; but the term as used in the paper includes the Portland Oolites, Portland Sands, and Upper Kimmeridge Clay of British authors.

Three new genera of ammonites are named, and two new zonal species of ammonites are defined.

# INDEX TO VOL. XII.

---

- ABRICTA**, new species of, 487.  
**Acantharctia**, new species of, 63.  
**Acolus**, characters of the new sub-genus, 479.  
**Actinostola callosa**, notes on, 382.  
**Adenota**, new subspecies of, 575.  
**Aderocharis**, new species of, 345.  
**Advena**, new species of, 526.  
**Agrotis**, new species of, 582.  
**Alcides**, new species of, 188.  
**Allactoneura**, note on the genus, 55.  
**Allenocoacha**, characters of the new genus, 523.  
**Alouatta**, new species of, 567.  
**Amblyrrhinus**, new species of, 187.  
**Ammocharidae**, on the British, 161.  
**Amphipoda Hyperiidea**, on the extra-antarctic, collected by the 'Discovery,' 245.  
**Ancistrosoma**, remarks on the genus, 425.  
**Ancistrus**, new species of, 470.  
**Andrena**, new species of, 104, 375.  
**Anomala**, new species of, 401.  
**Anthoglossa**, new species of, 373.  
**Anthracotheres**, on new, from Baluchistan, 514.  
**Anytus**, new species of, 589.  
**Apistogramma**, definition of the new generic name, 282.  
**Aplectoides**, new species of, 588.  
**Apogonia**, new species of, 399.  
**Arber**, Dr. E. A. N., on the Halesowen sandstone series, 320.  
**Arctocebus**, new species of, 357.  
**Aristomorphus**, characters of the new genus, 84.  
**Arrow**, G. J., on the lamellicorn genus *Popillia*, 38; on the lamellicorn coleoptera of Japan, 394; on the melolonthid genus *Ancistrosoma*, 425.  
**Aspidifrontia**, new species of, 599.  
**Atholus**, new species of, 82.  
**Auchenoglanis**, new species of, 68.  
**Austen**, E. E., on new diptera from the Falkland Islands, 498.  
**Autoserica**, new species of, 398.  
**Bagnall**, R. S., on new *Thysanoptera*, 290.  
**Balinta**, new species of, 287.  
**Baluchitherium**, definition of the new generic name, 504.  
**Barrett-Hamilton**, G. E. H., on three new voles from the Inner Hebrides, 361.  
**Bather**, F. A., on *Cydonocrinus parvulus*, 388.  
**Batrachians**, new, 70.  
**Beilania**, characters of the new sub-genus, 433.  
**Bellocoacha**, characters of the new genus, 529.  
**Bethune-Baker**, G. T., on new African heterocera, 62.  
**Birds**, new, 578.  
**Blair**, K. G., on new Indian *Tenebrionidae*, 56.  
**Blaps**, new species of, 56.  
**Boulenger**, G. A., on four new fishes from S. Cameroon, 67; on two species of toads from Cameroon, 70; on a new snake from Eastern Peru, 72; on five new cichlid fishes from Africa, 482; on new lizards, 563; on a new cyprinodont fish from the Sobat River, 566.  
**Brabourne**, Lord, synopsis of the genus *Tinamus*, 577.  
**Brachyodus**, new species of, 516.  
**Brycon**, new species of, 462.  
**Bryconamericus**, new species of, 464.  
**Bubalis**, new subspecies of, 576.

- Buckman, S. S., on the Kelloway Rock, 240.  
*Callicebus*, new subspecies of, 568.  
*Calliostoma*, new species of, 415.  
 Calman, Dr. W. T., on a new species of *Thaumastocheles*, 229.  
*Camarmena*, new species of, 58.  
 Cameron, M., on new *Staphylinidæ* from the West Indies, 321.  
*Cardita*, new species of, 238.  
*Centris*, new species of, 109.  
*Centrodaco*, definition of the new generic name, 145.  
*Ceratophyllus*, new species of, 542.  
*Champaka*, new species of, 80.  
*Charopa*, new species of, 432.  
*Chirolophius*, new species of, 280.  
*Chlamydopsis*, new species of, 86.  
*Chloridea*, new species of, 580.  
*Chromovalgus*, new species of, 408.  
*Chrysodomus*, new species of, 236.  
 Chubb, C., synopsis of the genus *Tinamus*, 577.  
*Cichlosoma*, new species of, 471.  
*Cifuna*, new species of, 64.  
*Cirphis*, new species of, 600.  
*Clarias*, new species of, 67.  
*Clathurella*, new species of, 235.  
*Clementia*, new species of, 58.  
 Cobbold, E. S., on the trilobite fauna of the Comley breccia-bed, 147; on two species of *Paradoxides* from Neve's Castle, 147.  
 Cockerell, T. D. A., descriptions and records of bees, 103, 368, 505.  
*Coleoptera*, new, 38, 56, 81, 181, 184, 321, 351, 394, 426, 443.  
*Compsothrips*, new species of, 295.  
*Conus*, new species of, 235.  
*Creagrutus*, new species of, 463.  
*Crinoids*, on British fossil, 388.  
*Criophthona*, new species of, 2.  
*Crocidura*, new subspecies of, 90.  
*Crocisa*, note on the genus, 93.  
*Crustacea*, new, 229, 248.  
*Cryptocharopa*, characters of the new genus, 534.  
*Cryptothrips*, new species of, 295.  
*Ctenophthalmus*, new species of, 539.  
 Cummings, B. F., on the crop in the Mallophaga, 266.  
*Cyclotus*, new species of, 437.  
*Cydonocrinus*, characters of the new genus, 391.  
*Cyrtepistomus*, characters of the new genus, 186.  
*Cythara*, new species of, 234.  
*Dasychira*, new species of, 64.  
*Dasygaster*, new species of, 599.  
 Davies, A. M., on two deep borings at Calvert Station, 151.  
 Dawson, C., on a palæolithic human skull from Piltown, 147.  
*Delopsis*, note on the genus, 55.  
*Dendrolamellaria*, characters of the new genus, 522.  
*Diademodon*, on the skull &c. of, 217.  
*Diancta*, new species of, 438.  
*Dianthidium*, new species of, 107.  
*Diapus*, new species of, 449.  
*Diceromorpha*, new species of, 182.  
*Diemeniana*, new species of, 488.  
*Diepenheimia*, characters of the new genus, 433.  
*Diplommatina*, new species of, 437.  
*Diptera*, new, 199, 498.  
 Distant, W. L., on new *Cicadidæ*, 76, 485; on Oriental rhynchota, 283; on some recently received rhynchota, 556.  
 Drake-Brockman, R. E., on a new subspecies of *Rhynchotragus damarensis*, 481.  
*Drillia*, new species of, 234.  
 Eaton, Rev. A. E., on *Ephemeridæ* from Tropical Africa, 271.  
*Eblisia*, new species of, 355.  
*Echiaster*, new species of, 336.  
*Echinus angulosus*, on the coloration of, 190.  
 — *esculentus*, on an abnormality in, 73.  
*Ectigonia*, new species of, 183.  
 Edwards, F. W., on some mycetophilid synonymy, 55; on new diptera from Ceylon, 199.  
*Elassoneuria*, new species of, 272.  
*Eligmodontia*, new subspecies of, 572.  
*Engina*, new species of, 413.  
*Epeolus*, new species of, 94.  
*Ephemeridæ* from Tropical Africa, on, 271.  
*Episilia*, new species of, 584.  
*Eriopyga*, new species of, 596.  
*Euryglossa*, new species of, 509.  
*Euthrips*, new species of, 291.  
*Euxoa*, new species of, 582.  
*Evotomys*, new species of, 361.  
*Exeristis*, new species of, 1.  
*Exorhabdus*, new species of, 355.



- Fanulum*, new species of, 527.  
*Felis*, new subspecies of, 91.  
*Fishes*, new, 67, 278, 281, 462, 482, 548, 555, 566; on the classification of the percoid, 111; on flying-, 544.  
 Forster-Cooper, C., on a new genus of perisodactyles from Baluchistan, 376; correction of generic name, 504; on new *Anthracotheres* and allied forms from Baluchistan, 514.  
*Fretum*, new species of, 526.  
 Frost, G. A., on the internal cranial elements of *Dapedius granulatus*, 242.  
*Geana*, new species of, 287, 562.  
*Gambusia*, new species of, 471.  
*Gastrolepecus*, on the anatomy of, 544.  
*Gastrophlakæis*, new species of, 66.  
*Gelasmodon*, new species of, 515.  
*Gemma*, note on the genus, 473.  
 Geological Society, proceedings of the, 146, 239, 319, 601.  
*Gerrhonotus*, new species of, 564.  
*Glyphostoma*, new species of, 233.  
*Gomphina*, note on the genus, 480.  
*Gonopionea*, characters of the new genus, 5.  
 Goode, R. H., on the fossil flora of the Pembrokehire coalfield, 319.  
*Greenwoodoconcha*, characters of the new genus, 525.  
 Gurney, R., on *Thersitina gasterostei*, 415.  
*Gymnodactylus*, new species of, 563.  
*Hadena*, new species of, 592.  
 Hampson, Sir G. F., on new species of *Pyrilidæ*, 1, 299; on new genera and species of *Noctuidæ*, 580.  
*Haphsa*, new species of, 559.  
*Haplochilus*, new species of, 566.  
*Haplothrips*, new species of, 296.  
*Haplotrinchus*, new species of, 182.  
 Hawkins, H. L., on an abnormality in *Echinus esculentus*, 73.  
*Heliothrips*, new species of, 291.  
*Hemiancistrus*, new species of, 469.  
*Hemimeryx*, new species of, 517.  
*Hemiscelus*, characters of the new genus, 259.  
*Hendrikia*, characters of the new subgenus, 435.  
*Hermellidæ*, on the British, 169.  
*Heterius*, new species of, 85.  
*Heteroptera*, new, 283, 556.  
*Hexagenia*, new species of, 276.  
 Hickling, Dr. G., on the variation of *Planorbis multiformis*, 243.  
*Himantium*, new species of, 189.  
 Hinton, M. A. C., on three new voles from the Inner Hebrides, 361; on the voles of the *orcadensis* group, 452.  
*Hipposideros*, new species of, 88, 205.  
*Hister*, new species of, 81, 356.  
*Holotrochus*, new species of, 325.  
*Homoptera*, new, 76, 285, 485, 557.  
 Hooley, R. W., on the skeleton of *Ornithodesmus latidens*, 239.  
*Hoplandethrips*, new species of, 297.  
*Hymenoptera*, new, 94, 103, 368, 491, 505.  
*Hyorrhynchus*, new species of, 446.  
*Hyootherium*, new species of, 521.  
*Hypanthidium*, new species of, 105.  
*Hyphessobrycon*, new species of, 465.  
*Hyssia*, new species of, 594.  
 Innes, D. E., on the internal structure of Upper Silurian rugose corals, 601.  
*Inthaxara*, characters of the new genus, 557.  
*Ioba*, new species of, 76.  
*Iredaleoconcha*, characters of the new genus, 530.  
 Jukes-Browne, A. J., on a new species of *Clementia*, 58; on the shells known as *Gemma*, *Parastarte*, and *Psephidia*, 473.  
*Kobonga*, new species of, 490.  
*Lælia*, new species of, 64.  
*Lepidoptera*, new, 1, 62, 299, 580.  
*Leptognathus*, new species of, 72.  
*Leptosaltria*, new species of, 558.  
*Leucania*, new species of, 601.  
 Lewis, G., on new species of *Histeridæ*, 81, 351.  
*Lima bullifera*, note on, 412.  
*Lineodes*, new species of, 306.  
*Lionycteris*, characters of the new genus, 270.  
*Lispinus*, new species of, 321.  
*Loricariichthys*, new species of, 281.  
*Lycophotia*, new species of, 587.  
*Lygosoma*, new species of, 565.  
 McIntosh, Prof., on two killers stranded at St. Andrews, 153; on the British *Ammocharidæ*, 161; on *Myriochele heeri* from the

- Gulf of St. Lawrence, 166; on the British *Hermellidæ*, 169.  
*Macrocera*, new species of, 200.  
*Macropus*, new subspecies of, 288.  
*Mallophaga*, on the crop in the, 266.  
*Mammals*, new, 88, 110, 205, 212, 270, 288, 358, 361, 376, 387, 457, 481, 514, 567, 574.  
*Mangilia*, new species of, 234.  
 March, Miss M. C., on the structure and relationships of the *Carbonicolæ*, 244.  
*Marmosa*, new species of, 573.  
 Marr, Dr. J. E., on the lower palæozoic rocks of the Cautley district, 146.  
 Marshall, G. A. K., on new Indian *Curculionidæ*, 184.  
*Mathewsoconcha*, characters of the new genus, 528.  
 Meade-Waldo, G., on the *Apidæ* in the British Museum, 92; on new species of *Apidæ*, 491.  
*Medon*, new species of, 344.  
*Megachile*, new species of, 103, 368, 493.  
*Megalops*, new species of, 326.  
*Meimuna*, new species of, 560.  
*Melampusalta*, new species of, 489.  
*Melanopsis*, new species of, 436.  
*Melanostoma*, new species of, 498.  
*Melolontha*, new species of, 400.  
*Mesalia*, new species of, 236.  
*Mesonychium*, synopsis of the species of, 94.  
*Metasia*, new species of, 2.  
*Micragrotis*, new species of, 581.  
*Micranops*, characters of the new genus, 350.  
*Microbunodon*, new species of, 519.  
*Microtus*, new subspecies of, 364.  
 ——— *orcadensis*, notes on, 452.  
*Miselia*, new species of, 591.  
*Mitra*, new species of, 236.  
*Mollusca*, new, 53, 233, 409, 432, 522.  
*Monista*, new species of, 339.  
*Morum ponderosum*, note on, 411.  
*Moussonia*, new species of, 439.  
*Munza*, new species of, 77.  
*Mustela*, new species of, 91.  
*Mycetophilidæ*, on the synonymy of the, 55.  
*Myllocerus*, new species of, 184.  
*Myoprocta*, new species of, 111.  
*Myriochele heeri* from the Gulf of St. Lawrence, on, 166.  
*Myxine capensis*, note on, 229.  
*Namacus*, new species of, 556.  
*Nannorhandia*, characters of the new genus, 467.  
*Nectomys*, new species of, 570.  
*Nectophryne*, new species of, 70.  
*Neohoplolomia*, characters of the new genus, 284.  
*Neopsylla*, new species of, 540.  
*Niponius*, new species of, 352.  
*Noctuelia*, new species of, 299.  
*Nomada*, new species of, 98.  
*Nomia*, new species of, 505.  
*Norfolciocncha*, characters of the new genus, 535.  
*Odontestra*, new species of, 591.  
*Opeas*, new species of, 435.  
*Ophiomedon*, new species of, 344.  
*Orca gladiator*, on two specimens of, stranded at St. Andrews, 153.  
*Oryzomys*, new species of, 571.  
*Osorius*, new species of, 326.  
*Owenia fusiformis*, note on, 161.  
*Pachycrærus*, new species of, 83.  
*Pachyprosopis*, new species of, 513.  
*Paguma*, new subspecies of, 289.  
*Palæodes*, characters of the new genus, 318.  
*Palaina*, new species of, 438, 537.  
*Palaminus*, new species of, 331.  
*Paracolletes*, new species of, 374.  
*Paragudanga*, characters of the new genus, 488.  
*Paralaoma*, new species of, 534.  
*Parastarte*, note on the genus, 475.  
*Paratalanta*, new species of, 22.  
*Paratilapia*, new species of, 483.  
*Parnkalla*, new species of, 487.  
*Pectinosoma*, characters of the new genus, 430.  
*Pelmatochromis*, new species of, 69, 484.  
*Peratodonta*, new species of, 63.  
*Percomorphi*, on the classification of the, 111.  
*Persectania*, new species of, 598.  
*Pezomyia*, characters of the new genus, 501.  
*Phallostethus*, characters of the new genus, 548.  
*Phascogale*, new subspecies of, 211.  
*Philander*, new subspecies of, 573.  
 ——— *laniger*, on the geographical races of, 358.

- Phronia, note on the genus, 55.  
 Physothrips, new species of, 292.  
 Pimelodella, new species of, 466.  
 Pinophilus, new species of, 330.  
 Pionea, new species of, 6.  
 Pittoconcha, characters of the new genus, 531.  
 Platyomia, new species of, 559.  
 Platypleura, new species of, 77.  
 Platypus, new species of, 447.  
 Platyraphe, new species of, 437.  
 Plecostomus, new species of, 555.  
 Pocock, R. I., on a new species of Agouti, 110.  
 Polydesmus coriaceus, new variety of, 439.  
 Popillia, new species of, 58.  
 Preston, H. B., on new mollusca from Beilan-Beilan, 432; on new mollusca from Norfolk Island, 522.  
 Pringle, J., on two deep borings at Calvert Station, 151.  
 Protætia, new species of, 404.  
 Pselliophora, new species of, 202.  
 Psephidia, note on the genus, 477.  
 Pseudopimelodus, new species of, 467.  
 Pycna, new species of, 235, 485.  
 Pygidium, new species of, 468.  
 Pygopus, new species of, 564.  
 Pyrausta, new species of, 23.  
 Quintalia, characters of the new genus, 527.  
 Rees, Miss O. M., on *Actinostola callosa*, 382.  
 Regan, C. T., on the classification of the percoid fishes, 111; note on *Myxine capensis*, 229; on fishes from Peru, 278, 281; on the fishes of the San Juan River, 462; on a new cyprinodont fish, 548; on a new loricariid fish from Rio Janeiro, 555.  
 Reptiles, new, 72, 563.  
 Retithrips, new species of, 290.  
 Rhamdia, new species of, 281.  
 Rhinopoma, new subspecies of, 89.  
 Rhogeesa, new species of, 569.  
 Rhynchotragus, new subspecies of, 481.  
 Ridewood, Dr. W. G., on the S.-American freshwater flying-fish and the common flying-fish, 544.  
 Rothschild, Hon. N. C., on new Siphonaptera from Asiatic Russia, 538.  
 Rothschild, Hon. W., on some new forms of antelope, 574.  
 Roybellia, characters of the new genus, 526.  
 Sabellaria, notes on species of, 169.  
 Salfeld, Dr. H., on certain Upper Jurassic strata of England, 602.  
 Saliunca, new species of, 67.  
 Salvazana, characters of the new genus, 286.  
 Sampson, Lt.-Col. W., on new Ipidæ and Platypodidæ from India and Burma, 443.  
 Saprinus, new species of, 37.  
 Schausia, new species of, 66.  
 Schwarz, E., on a kangaroo and a new palm-civet, 288.  
 Scopæus, new species of, 346.  
 Selbie, C. M., on a new variety of *Polydesmus coriaceus* and on a centipede monstrosity, 439.  
 Sericania, new species of, 397.  
 Setenis, new species of, 57.  
 Siphonaptera, on new Asiatic, 538.  
 Smith, E. A., on marine shells from Henderson Island, 409.  
 Smith, Dr. G. E., on a palæolithic human skull from Piltown, 149.  
 Smith, S., on the genus *Aulophyllum*, 146.  
 Sowerby, G. B., on new species of mollusca, 233.  
 Spath, L. F., on jurassic ammonites from Jebel Zaghuân, 241.  
 Stannoderus, new species of, 333.  
 Staphylinidæ, new, from the West Indies, 321.  
 Stauropus, new species of, 62.  
 Stenomys, new species of, 206.  
 Stenoptycha, new species of, 302.  
 Stenus, new species of, 329.  
 Stewart, Miss D. A., on the extra-antarctic amphipoda collected by the 'Discovery,' 245.  
 Stigmatogaster subterraneus, note on a monstrosity of, 440.  
 Stilicopsis, new species of, 332.  
 Stilicus, new species of, 340.  
 Succinea, new species of, 536.  
 Synodontis, new species of, 69.  
 Taurotragus, new subspecies of, 575.  
 Tegostoma, new species of, 299.  
 Tellina, new species of, 237.  
 Thaumastocheles, new species of, 229.

- Thaumastoherium*, characters of the new genus, 376.  
*Thaumatosoma*, new species of, 491.  
*Thersitina gasterostei*, remarks on, 415.  
*Thinobius*, new species of, 324.  
*Thinocharis*, new species of, 342.  
 Thomas, H. H., on the flora of the Marske quarry, 150.  
 Thomas, O., on new feræ from Asia and Africa, 88: on new mammals from Dutch New Guinea, 205: on new species of *Uromys*, 212: on a new genus of glossophagine bat, 270: on the geographical race of the woolly opossum, 358: on a new species of dwarf potto, 387: on new mammals from S. America, 567.  
 Thompson, B., on the geology of Northern Peru, 242.  
 Thompson, C., on the derived cephalopoda of the Holderness drift, 151.  
 Thomson, Dr. J. S., on the coloration of *Echinus angulosus*, 190.  
*Thoracophorus*, new species of, 323.  
*Thrips*, new species of, 294.  
*Thysanoptera*, new, 290.  
*Tilapia*, new species of, 482.  
*Tinora*, new species of, 581.  
*Tinamus*, synopsis of the genus, 577.  
*Tomaspis*, new species of, 563.  
*Tornatellina*, new species of, 536.  
*Trentepohlia*, new species of, 204.  
*Trichophotia*, characters of the new genus, 586.  
*Trichothrips*, new species of, 298.  
*Tritonidea*, new species of, 414.  
*Trogophloeus*, new species of, 323.  
*Trypanæus*, new species of, 354.  
*Uromys*, new species of, 208, 212.  
*Valgus*, notes on species of, 407.  
*Vibilia*, new species of, 248.  
 Waterhouse, C. O., on coleoptera of the family Buprestidæ, 181.  
 Watson, D. M. S., on the skull &c. of *Diademodon*, 217.  
*Wilhelminaia*, characters of the new genus, 434.  
 Woodward, Dr. A. S., on a palæolithic human skull from Piltdown, 147.  
*Xenurocharax*, characters of the new genus, 463.  
*Xyleborus*, new species of, 443.  
*Xyloterus*, new species of, 445.

END OF THE TWELFTH VOLUME.





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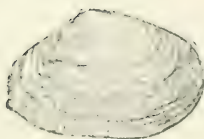
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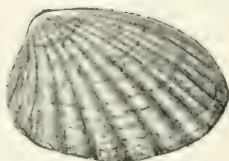
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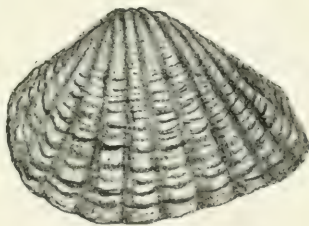
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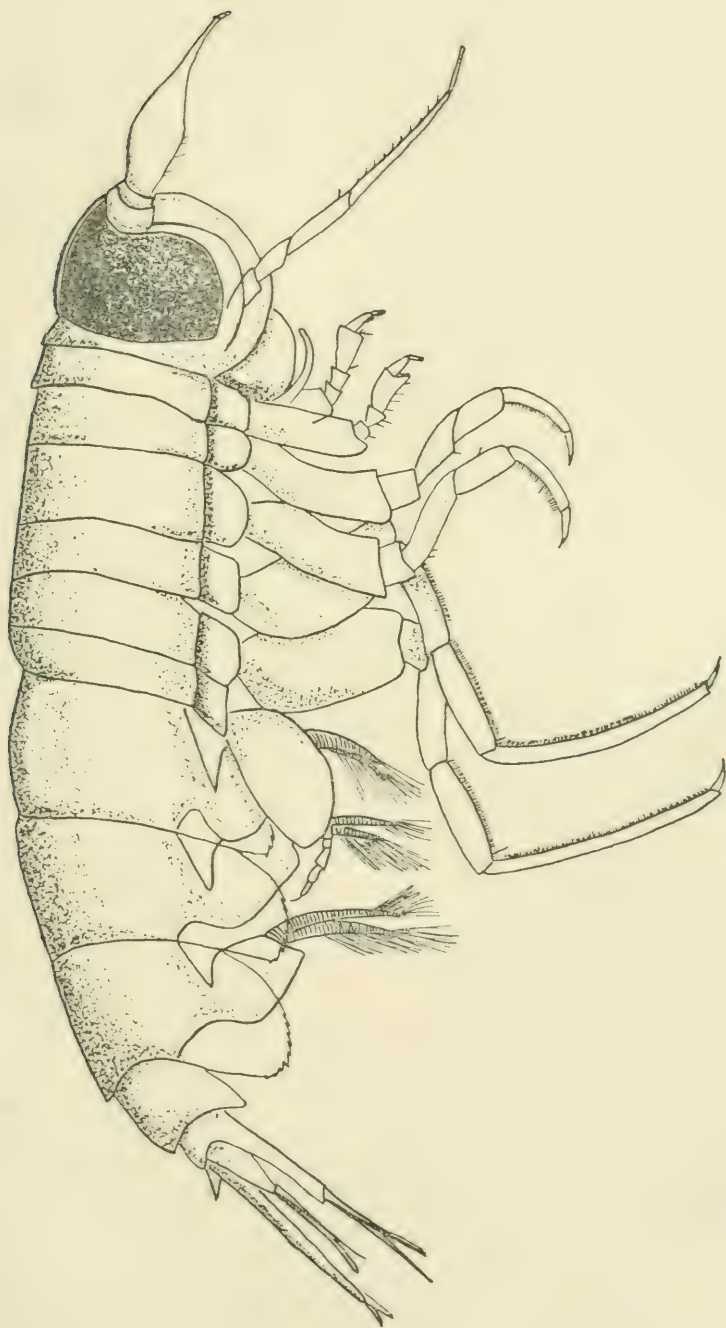


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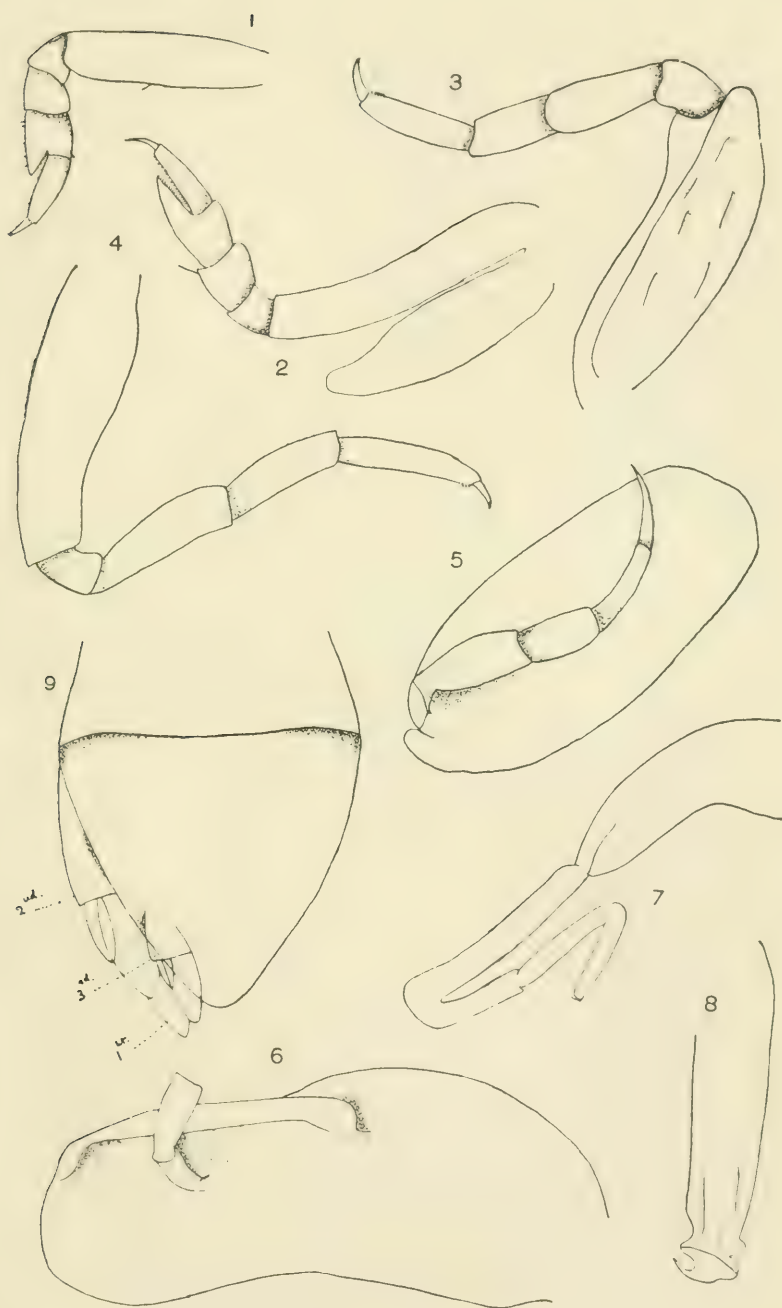




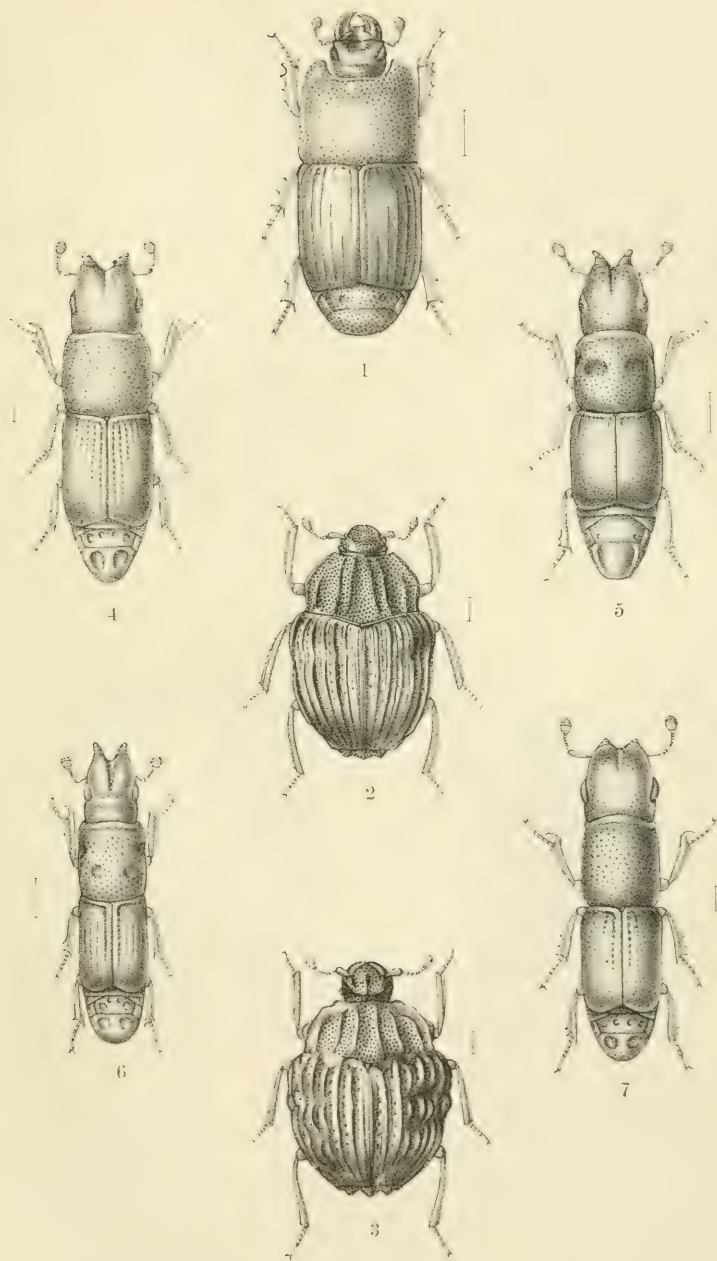


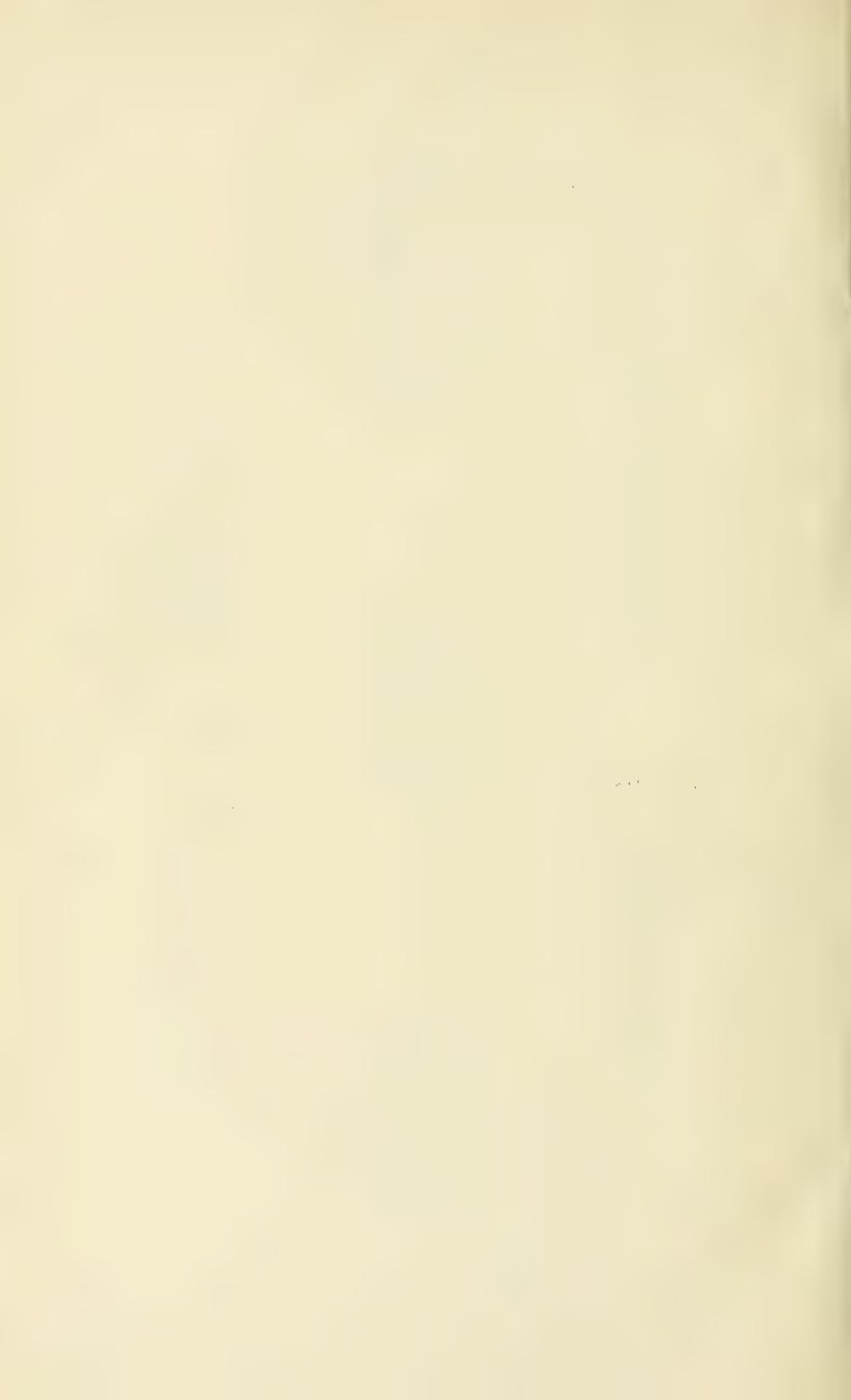








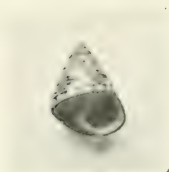








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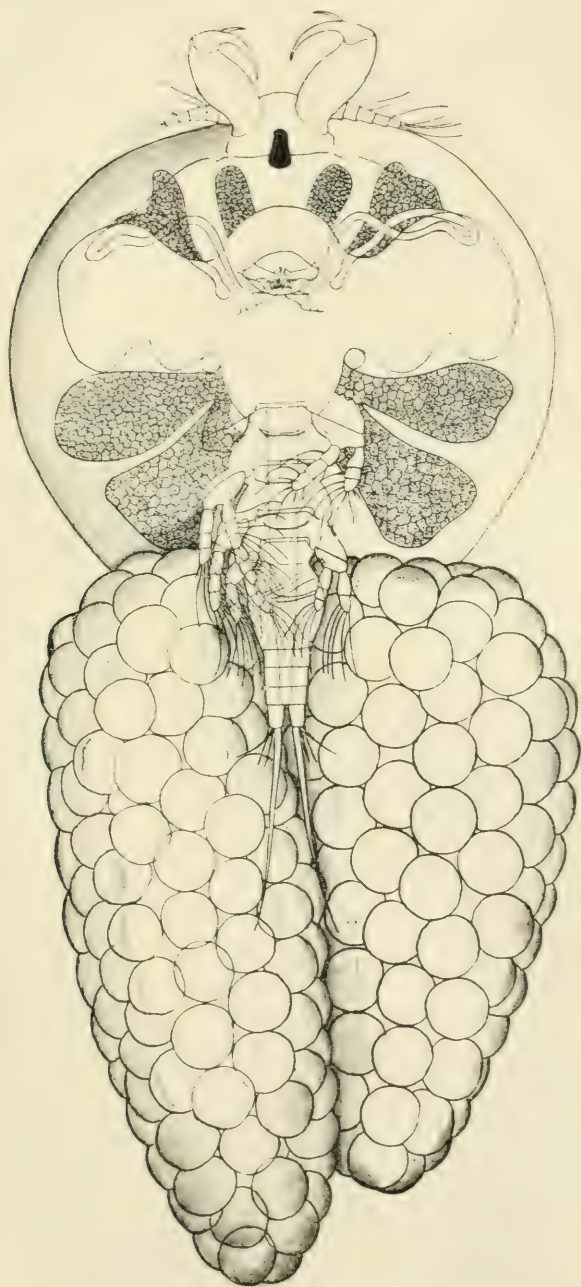
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Mollusca from Henderson Island.

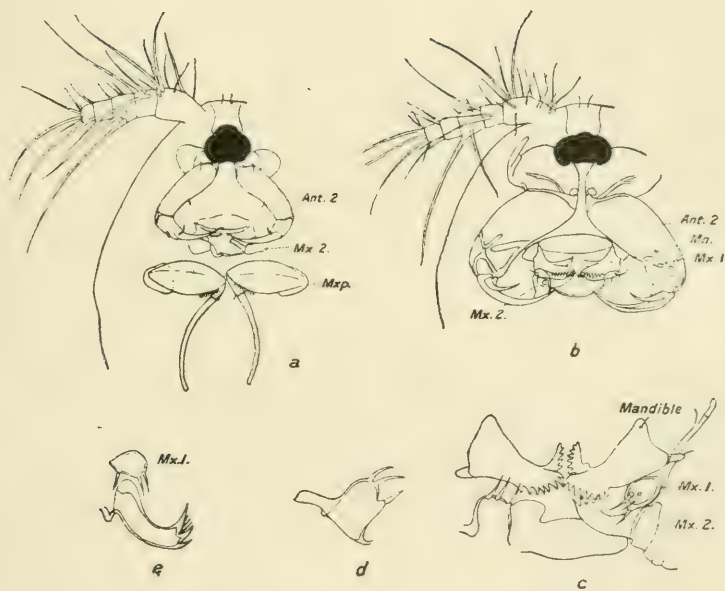




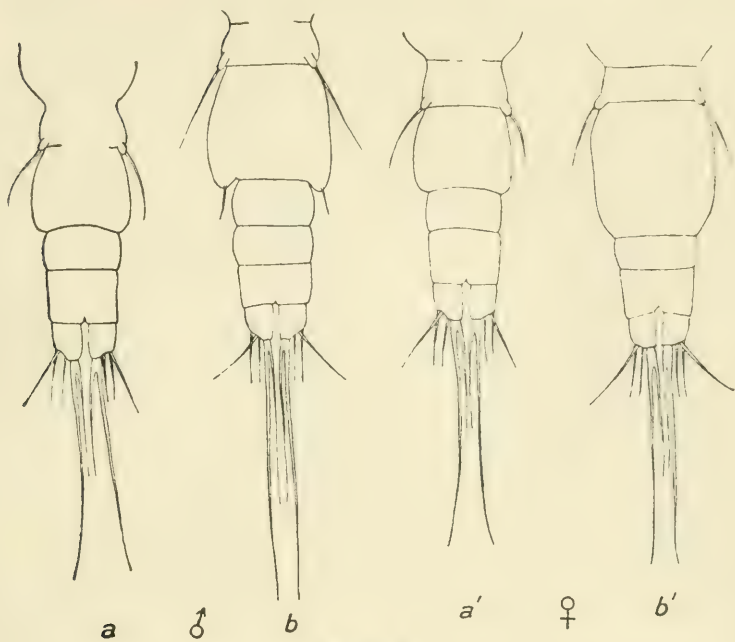
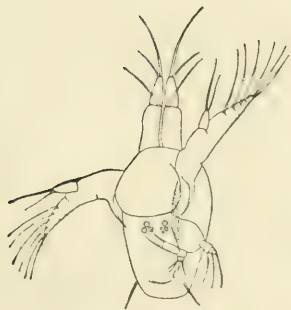
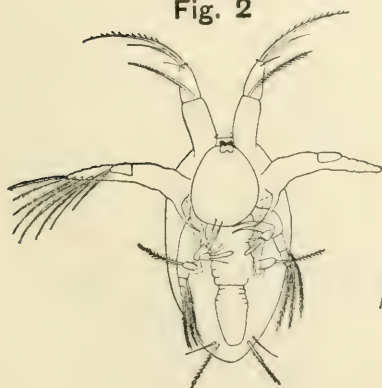
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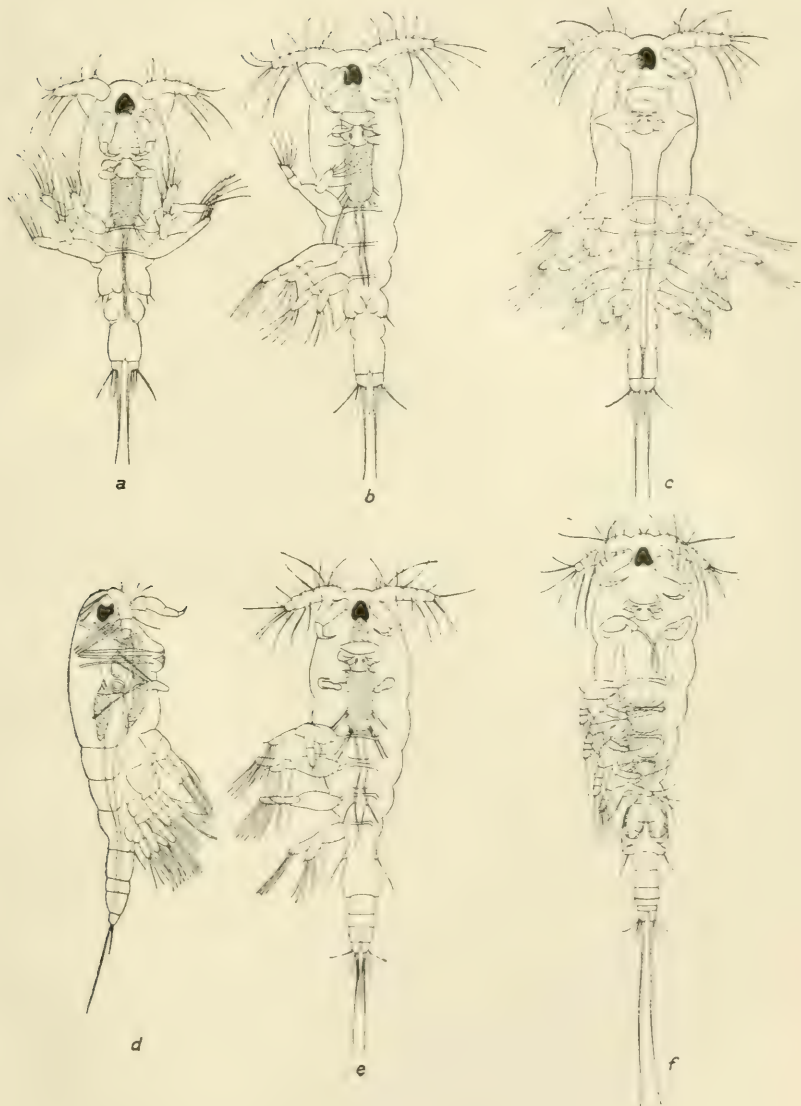




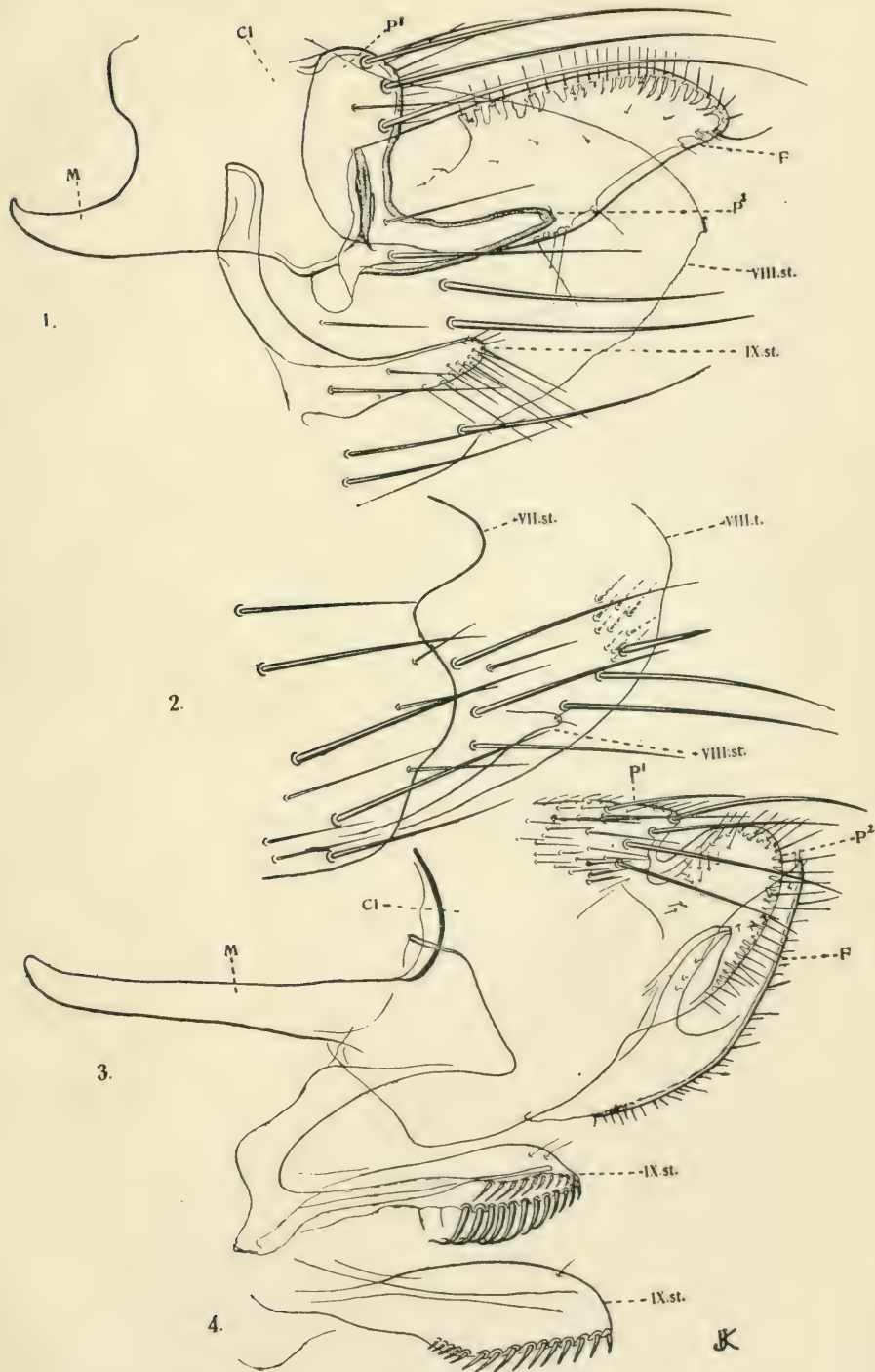
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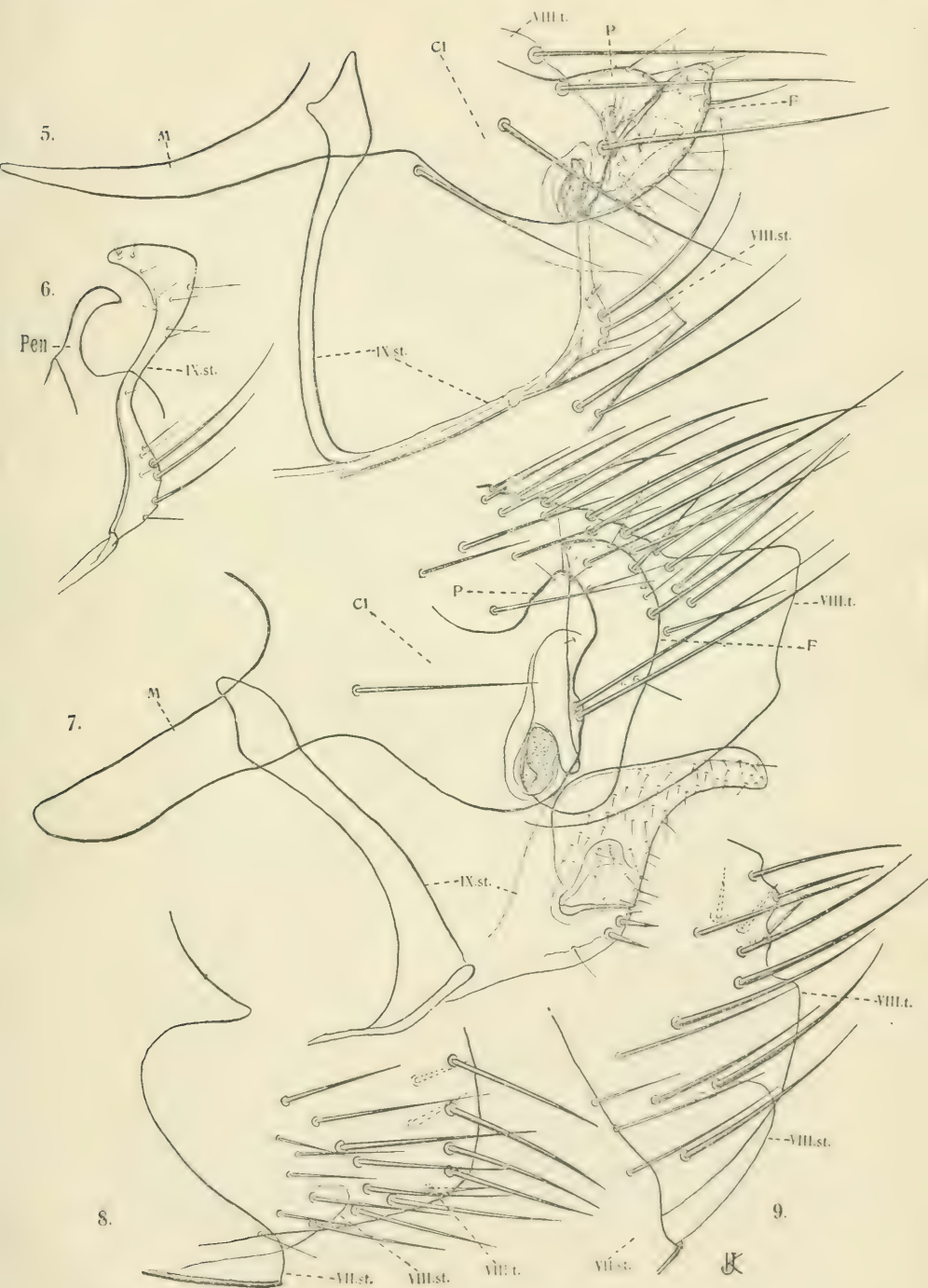




Siphonaptera from Asiatic Russia.







Siphonaptera from Asiatic Russia.



GASTROPELECUS STELLATUS.











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